MADONNA UNIVERSITY, NIGERIA

FACULTY OF SCIENCE

DEPARTMENT OF BIOCHEMISTRY

Student's Handbook

Undergraduate Academic Programme

Revised Edition: 2016

1.0 DEPARTMENTAL INFORMATION

1.1 History of Biochemistry Department

The Department of Biochemistry started as a unit under the Department of Science, Faculty of Engineering, Science and Technology in May 1999. Mr. Victor Enemuo was the first coordinator. In 2002, the Department of Chemical Sciences was created under the same Faculty, with Biochemistry and Industrial Chemistry as the two programmes. Dr. Igwilo I.O was then appointed Acting Head of Department. During the first National University Commission's accreditation visit in April, 2004, the Institution was advised to create a separate Faculty of Science. In November 2004 the Faculty of Science was created and four units were raised to full departmental status. These were; Departments of Biochemistry, Computer sciences, Industrial chemistry and Microbiology. Dr. Igwilo I.O was then appointed the first Head of Department of Biochemistry in Madonna University.

The Department has been teaching Biochemistry to its students and students from other departments of the University. Presently the teaching responsibilities include: B.Sc. Biochemistry, Medical Biochemistry (College of Medicine and Health Sciences) and General Biochemistry to Science and Pharmacy Students. The academic staff strength of the Department is very robust and effective. Currently there are eighteen (18) academic members of staff in all areas of specialization in biochemistry and Dr. Philippe E. Mounmbegna is the Acting Head of Department.

The academic members of staff are very dedicated and effective lecturers. They have trained over 400 B.Sc. (Hons) Biochemistry students. They have contributed to the training of all the Medical Doctors, Pharmacists, Anatomists, Physiologists and Microbiologist etc. who have graduated from Madonna University Nigeria. They have also been involved in the training of Medical Laboratory Sciences and Nursing students. The first student intake of the programme was eleven (11). Students started graduating from the programme in 2003. Admission is by examination UME or Direct Entry after the University screening exercise. Students admitted through entrance examination undergo a four years degree programme while those admitted through Direct Entry undergo a three years degree programme**.**

Staff of Biochemistry Department have been very regular and consistent in their participation at national and international conferences. Governance of our Department adopts an integrated approach in which each member of staff is assigned to a duty as a coordinator or officer. Main duties in the Department are carried out by these coordinators/officers. These officers in turn report to the Head of Department who supervises their duties. Departmental meetings are held on first Wednesday of each month from 12:00 p.m. During monthly meetings issues affecting or likely to affect the wellbeing of biochemistry staff and students as well as the teaching of the courses are raised, deliberated, debated and finally resolved in a cordial way that enhances the sustainability of our role as staff and relationship with students and the University administration.

1.2 Philosophy

Biochemistry is the bedrock of the Medical Sciences and the foundation from which Biomolecular Sciences derive their basic ideas and techniques in the service of mankind and humanity. It is the basis of the Biotechnology Industry, Molecular Biology, Biotechnology, Immunology, Neurochemistry and Forensic Science, while the new and exciting disciplines of proteomics, genomics, bioinformatics, genetic engineering, and drug design all rely on the knowledge of and competency in biochemistry and molecular biology.

It is against this background that the B.Sc. Biochemistry degree programme in Madonna University, Nigeria will continue to promote sound education and cutting-edge research in Biochemistry, with a view to producing exemplary graduates who will be able to compete globally, especially in World-class universities and institutions and be competent to work in specialized areas such as Medicine, Pharmaceutical and Food Industries, Agriculture, Environment and Bioengineering.

1.3 Objectives and Scope of Programme

Deriving from the broad philosophy of the Department, the following objectives are pursued:

- ***a.*** To provide students with a broad and balanced foundation of sound scientific, biochemical knowledge and practical skills.
- ***b.*** To develop in students the ability to apply knowledge and skills to solving theoretical and practical problems in biochemistry.
- ***c.*** To train students are trained to develop a range of transferable skills that are of value in biochemical and non-biochemical employment
- ***d.*** To equip students with knowledge and skills with which they can proceed to postgraduate research and training in specialized areas of biochemistry or multi-disciplinary areas involving biochemistry; or enter the work force, especially in the private sector, as allied health professionals, laboratory or field scientists.

e. To provide, through training and orientation, strong analytical, problem-solving and critical thinking abilities and arm them with excellent research and communication skills and multi-disciplinary approach to the solution of complex life problems.

f. To generate in students an appreciation of the importance of biochemistry in industrial, economic, environmental, technological and social development.

g. To instill in students a sense of enthusiasm for biochemistry, an appreciation of its application in different contexts and to involve them in an intellectually stimulating and satisfying experience of learning and studying.

Thus, the degree programme lays emphasis on topics such as nutrition and food science, biochemistry of soil and microorganisms, plants and animals, biochemical aspects of diseases, biochemical basis of chemotherapy, including African traditional Medicine and human biochemical genetics. The inclusion of Research project on local biochemical topics as one of the compulsory courses in the final year of every biochemistry student is to achieve these objectives.

1.4 Admission Requirements

(i) UME Entry Requirements: Students applying for the four years programme for the award of Bachelor of sciences of Madonna University must satisfy the minimum University Matriculation Requirements. Such students must have at least five credit (5) passes in biology, chemistry, mathematics, physics, and English language in the West African School Certificate or its equivalent (GCE, SSCE, NECO), in not more than two sittings.

(ii) Direct Entry Requirements: In addition to requirements in the above, candidates who possess any of the following qualifications can be considered for admission.

a. At least two advanced Level passes in the General Certificate of Education (GCE) or the Higher School Certificate (HSC) or any of their recognized equivalents at not more than two sittings. The subjects should include any two of Physics, Chemistry and Biology.

b. Diploma from other recognized Universities with at least an Upper credit level pass in any of the following:
- ✓ Food And Brewing Science (DFBS)
- ✓ Analytical And Industrial Chemistry (DAIC)
- ✓ Science Laboratory Technology (DSLT)

c. Ordinary National Diploma (OND) with at least an Upper credit level pass in the areas listed above

d. Higher National Diploma (HND) with at least an Upper credit level pass in Science Laboratory Technology (SLT) or Food Technology from recognized Polytechnic or College of Technology.

1.5 Graduation Requirements

Students are required to complete a minimum of 128 units for graduation, 60 of which must come from Biochemistry.

1.6 Programme Leading to the B.Sc. (Honours) degree in Biochemistry

Courses at 200 & 300 levels are open to students from other disciplines/departments, while 400 level courses are mainly for final year students majoring in biochemistry as well as other undergraduate students from other departments possessing the necessary pre-requisites and postgraduate students of biochemistry and allied disciplines requiring remedial biochemistry at this level.

1. At 100 level, Biochemistry majors take courses in Botany, Zoology, Chemistry, Physics and General Studies.
2. At 200 level, apart from the listed core courses in Biochemistry, students are required to take stipulated courses in other science subjects.
3. At 300 level, in addition to the indicated core courses in Biochemistry, students are expected to take courses in Chemistry, Microbiology, Physiology, Botany and Anatomy.
4. At 400 level, Biochemistry majors take all their courses from the department of Biochemistry.

1.7 Facilities for Research

The Department is continuously improving on the facilities for research. In addition to the usual conventional laboratory equipment which is fully provided, the Department possesses a functional flame photometer, refrigerated centrifuge and HPLC equipment tough yet to be mounted. Arrangements have recently been made by the University to provide the Department with a functional amino acid analyzer, a Gas Chromatography – Mass Spectrophotometer and PCR machine. There is also reasonable technical support available in the department. The department is preparing an application to Seeding Labs (Boston, USA) for an equipment grant to conduct life-changing research.

1.8 Job Opportunities

Opportunities abound for Graduates of Biochemistry in the following areas:

1. ***Agriculture and Veterinary Science*****:** to study soils, feedstuffs, insecticides, plant and animal nutrition and disease, biochemical aspects of germination, growth, ripening and spoilage of fruits, vegetables and crops.
2. ***Industrial Raw Material Research and Development:*** to study tropical products of economic significance (such as hides and skins), commercially important natural fibers, timbers, gums, resins and other forest products with particular reference to the biochemical problems associated with their production, utilization, storage, biodeterioration etc.
3. ***Health Sector:*** in disease diagnosis and treatment through the application of innovations in Enzymology and Biotechnology.
4. ***Oil and Gas:*** application of Biotechnological techniques in exploration and development of oil and gas; Environmental management- Pre- and Post- Environmental Impact Assessment (EIA), and Bioremediation; Health- Safety and Environment (HSE).
5. ***Law and Politics:*** harnessing the knowledge of Genetic Engineering in crime bursting and detection, formulation of national policy on science and technology.
6. ***Education and Human Development:*** training the mind and contributing to manpower resource development.

1.9 Definition of Terms

General Study Courses: A course which every student in the University must compulsorily take and pass at foundation level. They are not directly related to any programme, but are necessary in the holistic formation of students before graduation.

Core/Compulsory Course: A course which must be registered for and passed by a student to obtain the degree in Biochemistry.

Required ancillary Course: A course that a student takes at a level of study and must be passed before graduation.

Elective Course**:** A course that students take within or outside the faculty. Students shall choose an elective course from among three others in order to make up the required additional units for the award of the degree. Students may graduate without passing the course provided the minimum credit unit for the course had been attained.

Pre-requisite Course: A course which student must take before the course for which it is a prerequisite can be taken. Courses can only be designated prerequisite to other courses at a higher level. A prerequisite may be waived for a suitably qualified candidate by the Department.

Credit Load per Semester: The Minimum credit load per semester is 15 units while the maximum is 24 units.

Course Unit: A series of approximately 15 one-hour lectures, or tutorials or 15 x 3-hour laboratory or field practical classes, or an equivalent amount of assigned study, or any combination of the above.

Course Credit Unit System: This should be understood to mean a 'quantitative system of organization of the curriculum in which subject areas are broken down into unit courses which are examinable and for which students earn credit(s) if passed'. The courses are arranged in progressive order of difficulty or in levels of academic progress, e.g. Level or year 1 courses are 111, 112 etc. and Level II or Year II courses are 211, 212 etc. The second aspect of the system is that courses are assigned weights allied Credit Units.

Grade Point Average (GPA): Performance in any semester is reported in Grade Point Average. This is the average of weighted grade points earned in the courses taken during the semester. The Grade Point Average is obtained by multiplying the Grade Point average in each course by the number of Credit Units assigned to that course, and then summing these up and dividing by the total number of Credit Units taken for the semester

Cumulative Grade Point Average (CGPA): This is the up-to-date mean of the Grade Points earned by the student in a programme of study. It is an indication of the student's overall performance at any point in the training programme. To compute the Cumulative Grade Point Average, the total of Grade Points multiplied by the respective Credit Units for all the semesters are added and then divided by the total number of Credit Units for all courses registered by the student

1.10 General Studies (GST)

Goal

The goal of GST courses is to produce a well-rounded, morally and intellectually capable graduate with vision and entrepreneurial skills in an environment of peace and social cohesiveness.

Objectives: The objectives of the General Studies programme consist of the following:
(a) Acquisition, development and inculcation of the proper value-orientation for the survival of the individual and society.
(b) The development of intellectual capacities of individuals to understand, appreciate and promote peaceful co-existence.
(c) Production of graduates with broad knowledge of individual of Nigerian Nationals and people with a view to inculcating in them mutual understanding and patriotism.
(d) Exposing graduates of Nigerian Universities to the rudiments of ICT for computer literacy and ability to live usefully in this ICT age.
(e) Preparing students for a post university life with opportunities for job creation and entrepreneurial skills.
(f) Production of graduate capable of communicating effectively (both oral and written).

1.11 Course Coding

A course is coded by a combination of three letters and three digits. The three letters code stands for the Department offering the course. Biochemistry courses are coded as BCH. For the three digits numbers, the first digits indicates the year of study, the second indicates the subject stress area while the third digit shows the semester. First semester are represented with odd numbers while second semesters are represented with even numbers.

1.12 Admission and Withdrawal from Courses

(a) Admission into courses closes at the end of the third full week of each semester. Students who fail to register as stated shall be considered for late registration. Any student who fails to register within the first two weeks after late registration has commenced shall be advised to defer the semester. Only in special circumstances and through the approval of the Vice Chancellor on behalf of the Senate, may a student be allowed to register thereafter. An application for late registration shall normally attract a prescribed fee.
(b) A student can withdraw from a course without penalty any time up to and including the seventh week of the semester. Any student who withdraws after the seventh week will be deemed to have failed except in special cases approved by Senate.
(c) The minimum load permissible per semester is 15 units while the maximum load is 24 units. However, a final year student who requires less than 15 units of courses in either semester to complete graduation requirements will be allowed to register for the outstanding courses only. Students who wish to register above 24 units must seek the approval of the University Senate through the Vice Chancellor through the Dean of the Faculty and through the Head of Department.
(d) A final year student is one who has not more than 48 units of workload to graduate. Students with more than 48 units outstanding will be asked to stay back in 300 level.

1.13 Academic Standing

(a) The maximum time a student can spend in Biochemistry Department is as itemized below:
(i) for a 3-year programme (direct entry), 10 semesters or 5 sessions
(ii) for a 4-year programme, 12 semesters or 6 sessions;

(b) Any student whose semester GPA is below 1.00 for the first time shall be placed on Probation.
(c) Any 100 Level students whose semester GPA is less than 1.5 for two consecutive semesters will be asked to withdraw from the course. This also applies to students admitted by Direct Entry.
(d) For the avoidance of doubt, any student desiring transfer from another course to Biochemistry shall not be admitted if it is certain that he/she cannot complete the programme and graduate within the stipulated period for the course as in (a) above.

2. COURSE EVALUATION

2.1 Continuous Assessment

The progress of the students enrolled in each course is continuously assessed by means of tests; written assignments, reports and/or such other means as may be consistent with the objectives and conduct of the course as determined by the Department.

2.2. Examinations

(a) Each course is normally examined at the end of the semester in which it is offered.
(b) The length of any examination shall be a period of not less than one hour and not more than three hours.

2.3 Final Marks

(a) Each course shall be graded on the basis of 100 total marks with proportions for continuous assessment and course examination as determined by the appropriate Faculty Board. In no case shall the proportion for continuous assessment be less than 30% or greater than 50% except in cases specified by the Faculty Board. The minimum pass mark in any course shall be 45% (applicable to students admitted from 2014/2015 and beyond)

(b) Each course shall be graded out of a maximum of 100 marks and the score for each course shall be assigned appropriate letter grades and grade points as follows:

Mark	Letter Grade	Grade Point
70 – 100	A	5.0
60 – 69	B	4.0
50 – 59	C	3.0
45 – 49	D	2.0
40 – 44	E	1.0
0 – 39	F	0.0

2.4 Probation: Probation is a status granted to a student whose academic performance falls below an acceptable standard. A student whose Cumulative Grade Point Average is below 1.50 at the end of a particular year of study, earns a period of probation for one academic session.

2.5 Withdrawals: A candidate whose Cumulative Grade Point Average is below 1.50 at the end of a particular period of probation should be required to withdraw from the University. However, in order to minimize waste of human resources, consideration is given to withdrawal from programme of study and possible transfer to other programmes within the University.

2.6 Repeating Failed Course Unit(s) (Carry Over)

Subject to the conditions for withdrawal and probation, student may be allowed to repeat the failed course unit(s) at the next available opportunity, provided that the total number of credit units carried during that semester does not exceed 24, and the Grade Points earned at all attempts shall count towards the CGPA.

2.7 External Examiner System

External Examiners are invited only in the final year of the undergraduate programme to assess final year courses and projects, and to certify the overall performance of the graduating students as well as the quality of facilities and teaching.

2.8 Classification of Degrees

(a) For the purpose of classification of degrees, all courses taken by students shall count. Degree classification shall be based on the cumulative grade point average (CGPA) obtained by each student as follows (applicable to students admitted from 2014/2015 session onward);

Class of Degree	CGPA
First Class	4.50 - 5.00
2nd Class Upper	3.50 - 4.49
2nd Class Lower	2.40 - 3.49
Third Class	1.50 - 2.39
Pass	1.00 – 1.49
Fail	Below 1.00

Stress Areas	Code
General/Functional Biochemistry	0
Metabolism of Biomolecules/Regulation of Pathways	1
Membrane Biochemistry/Bioenergetics	2
Industrial/Food/Nutritional Biochemistry/Toxicology	3
Plant/Tissue Biochemistry	4
Pharmacological Biochemistry/Immunochemistry/Inorganic Biochemistry	5
Biochemical Methods/Biochemical Reasoning/Biochemical Literature and Philosophy of Science	6
Enzymology/Genetic Engineering/Medicinal Chemistry	7
Seminar/Industrial Training	8
Research Project	9

FOUR YEAR DEGREE PROGRAMME IN BIOCHEMISTRY

YEAR ONE: FIRST SEMESTER

Course Code	Course Title	Units
Required Ancillary Courses		
BIO 101	General Biology I	**3**
CHM 101	General Chemistry I	**3**
CHM 171	General Practical Chemistry I	**1**
MTH 101	General Mathematics I	**3**
PHY 101	General Physics I	**3**
PHY 105	General Physics Laboratory I	**1**
General Studies Courses		
GST 111	Communication in English I	**2**
GST 113	Nigerian People and Culture	**2**
GST 125	Introduction to Entrepreneurship Studies I	**2**
GST 123	Communication in French	**2**
GST 121	Use of Library, Study Skill and Information Technology	**2**
Total		**24**

YEAR ONE: SECOND SEMESTER

Course Code	Course Title	Units
Required Ancillary Courses		
BIO 102	General Biology II	**3**
BIO 172	General Biology Practical	**1**
CHM 102	General Chemistry II	**3**
CHM 122	Organic Chemistry I	**1**
CHM 172	General Practical Chemistry II	**1**
MTH 102	General Mathematics II	**3**
PHY 102	General Physics II	**3**
PHY 106	General Physics Laboratory II	**1**
General Studies Courses		
GST 104	Fundamental Philosophy	**1**
GST 112	Logic, Philosophy and Human Existence	**2**
GST 122	Communication in English II	**2**
GST 142	Communication in German	**1**
GST 162	Introduction to Social Science	**2**
Total		**24**

YEAR TWO: FIRST SEMESTER

Course Code	Course Title	Units
Core Courses		
BCH 201	General Biochemistry I	**3**
Required Ancillary Courses		
BIO 211	Introduction to Genetics	**2**
CHM 231	Physical Chemistry I	**2**
CHM 221	Organic Chemistry II	**2**
CHM 271	Practical Chemistry I	**1**
CSC 211	Computer Programming I (with Pascal)	**3**
MCB 211	General Microbiology	**3**
General Studies Courses		

GST 211	Fundamental Theology	**1**
GST 215	Introduction to Entrepreneurship Studies II	**2**
Total		**19**

YEAR TWO: SECOND SEMESTER

Course Code	Course Title	Units
Core Courses		
BCH 202	General Biochemistry II	**3**
BCH 204	Functional Biochemistry	**2**
BCH 224	Membrane Biochemistry	**1**
BCH 228	Bioenergetics	**1**
Required Ancillary Courses		
CHM 212	Inorganic Chemistry I	**2**
CHM 272	Practical Chemistry II	**1**
BIO 272	Biological Techniques	**2**
CSC 104	Introduction to Computer Science	**2**
STA 212	Statistics for Biological Sciences	**3**
General Studies Courses		
GST 222	Peace Studies and Conflict Resolution	**2**
GST 224	Fundamental Ethics	**1**
Total		**20**

YEAR THREE: FIRST SEMESTER

Course Code	Course Title	Units
Core Courses		
BCH 311	Metabolism of Carbohydrate	**2**
BCH 313	Metabolism of Lipids	**2**
BCH 315	Metabolism of Amino Acid & Proteins	**2**
BCH 317	Metabolism of Nucleic Acid	**2**
BCH 361	Techniques in Biochemistry & Mol. Biology	**2**
BCH 363	General Biochemistry Laboratory I	**1**
BCH 371	Introduction to Enzymology	**3**
Required Ancillary Courses		
CHM 321	Organic Chemistry III	**2**
CHM 331	Physical Chemistry II	**2**
MCB 333	Microbial Physiology & Metabolism	**3**
Total		**21**

YEAR THREE: SECOND SEMESTER

Course Code	Course Title	Units
BCH 382	Students Industrial Work Experience Scheme (SIWES)	**15**
Total		**15**

YEAR FOUR: FIRST SEMESTER

Course Code	Course Title	Units
Core Courses		
BCH 411	Biosynthesis of Macromolecules	**2**
BCH 415	Metabolic Regulations	**2**
BCH 431	Industrial Biochemistry	**3**
BCH 441	Tissue Biochemistry	**2**
BCH 443	Plant Biochemistry	**2**
BCH 451	Pharmacological Biochemistry	**2**
BCH 433	Food and Nutritional Biochemistry	**2**
BCH 461	Biochemical Reasoning	**1**
BCH 481	Special Topics/Seminar in Biochemistry	**2**
BCH 453	Immunochemistry	**2**
Total		**20**

YEAR FOUR: SECOND SEMESTER

Course Code	Course Title	Units
Core Courses		
BCH 472	Advanced Enzymology	**2**
BCH 462	Advanced Biochemical Methods	**2**
BCH 474	Biotechnology & Genetic Engineering	**3**
BCH 464	Intro. to Biochem. Lit. and Phil. of Science	**2**
BCH 454	Bioinorganic Chemistry	**2**
BCH 492	Research Project	**6**
Electives **(a minimum of 2 credit units can be selected)**		
BCH 432	Biochemical Toxicology	**2**
BCH 476	Medicinal Chemistry	**2**
Total		**19**

INSTRUCTION TO DIRECT ENTRY STUDENTS

Students who gained admission directly into Year Two (200 Level) shall ensure that they register and pass the following General Studies Courses in addition to all the courses listed above from 200 level before graduation.

FIRST SEMESTER (DIRECT ENTRY CANDIDATES)

Course Code	Course Title	Units
General Studies Courses		
GST 111	Communication in English I	**2**
GST 113	Nigerian People and Culture	**2**
GST 125	Introduction to Entrepreneurship Skills I	**2**
GST 123	Communication in French	**2**
GST 121	Use of Library, Study Skill and Information Technology	**2**
Total		**10**

SECOND SEMESTER (DIRECT ENTRY CANDIDATES)

S/N	Course Code	Course Title	Units
	General Studies Courses		
	GST 112	Logic, Philosophy and Human Existence	**2**
	GST 122	Communication in English II	**2**
	GST 162	Introduction to Social Science	**2**
	GST 104	Fundamental Philosophy	**1**
	GST 142	Communication in German	**1**
	Total		**8**

COURSE DESCRIPTION

FIRST YEAR

GST 125: Introduction to Entrepreneurial Skills I (2 Units)
Introduction to entrepreneurship and new venture creation; entrepreneurship in theory and practice, The opportunity, forms of business, staffing, marketing and the new venture; Determining capital requirements, Raising capitals, financial planning and management; starting a new business feasibility studies, innovation; legal issues; insurance and environmental considerations.

GST 111: Communication In English I (2 Units)
Effective communication and writing in English language skills. Writing of essay, letters, speeches, public announcements, minutes of meetings and term papers. Reading and listening comprehension. Construction of Sentences, outlines and paragraphs. Collection and organization of materials and logical presentation/punctuation.

GST 113: Nigerian People And Culture (2 Units)
Study of Nigerian history, culture and arts in pre-colonial times. Nigerian's perception of his world. Nigerian cultures and their characteristics. Evolution of Nigeria and their characteristics. Evolution of Nigeria political system, Indigene/ settler phenomenon. Concepts of trade, Economic self reliance, Social justice, Individual and national Development, Norms and values, Negative attitudes and conducts (cultism and related vices), Re-orientation of moral and national values, Moral obligations of citizens and Environmental problems.

GST 121: Use Of Library, Study Skills and Info, Comm Tech. ICT (2 Units)
Brief history of libraries, library and education, university libraries and other types of libraries, study skills (reference services). Types of library materials, using library resources including e-learning, e-materials etc. understanding library catalogues(CARD OPAC etc) and classification, copyright and its implications, Database resources, Bibliographic citations and referencing. Development of modern ICT, hardware technology, software technology, input devices, storage devices ,output devices, word processing skills (typing, etc).

GST 123: Communication in French (2 Units)
Introduction to French, alphabets and numeracy for effective communication (written and oral) conjugation and simple sentence construction based on communication approach, sentence construction, comprehension and reading of simple text.

GST 112: Logic, Philosophy and Human Existence (2 Units)
A brief survey of the main branches of philosophy, logic special symbols in symbolic logic conjunctions, negation, affirmation, disjunction, equivalent and conditional statement laws of torts. The method of deduction using rules of inference and bi-

conditionals qualification theory. Types of discourse, Nature of arguments, validity and soundness, Distinction between deductive and inductive inferences. Etc. illustration will be taken from familiar texts including literature materials, Novels, law reports and news paper publications.

GST 122: Communication in English II (2 Units)
Logical presentation of papers, phonetics, instruction of lexis, Arts of public speaking and oral communication, figures of speech, precise report writing.

BIO 101: General Biology I (3 Units)
Cell structures and organization; Plant and animal cells, Function of cellular organelles; diversity and characteristics of living things. General reproduction; mitosis, meiosis, abnormalities associated with gene crossing, heredity and evolution. Concept of ecology and types of habitats diversity of plants and animals. Food chains and food webs; interrelationship of organisms. Types of population dynamics, static, climax communities, types and factors affecting them. *Edaphic factors, rainfall, wind, relative humidity, light intensity etc. *Modification of the natural ecosystem.Elementary biochemistry of carbohydrates, protein, lipid and nucleic acids.

CHM 101: General Chemistry I (2 Units)
Atomic Structure and periodic table. Development of Configuration of Elements. Stoichiometry and mole concept. Electronic theory of atoms and valency. Chemical bonding. Formular and IUPAC basic nomenclature of compounds, Properties of gases; Equilibria and Thermodynamics; Chemical Kinetics; Electrochemistry. Radioactivity and its application. Phase equilibrium, study of one and two components systems.

CHM 102: General Chemistry II (3 units)

Structure of solid. Kinetic theory of gases and laws. Colligative properties of dilute solutions. Raoult's law, Henry's law and molecular weight determination. Thermo chemistry and Hess's law. Chemical Equilibrium. Law of mass action, reaction rate and chemical energetic. Electrochemistry. Ionic equilibrium. Theory of acids bases and indicators. Catalysis. Ionics, phase equilibrium, one and two component system. Enthalpy, Entropy and Free energy.

CHM 171: General Practical Chemistry I (1 Unit)
The theory and practice of simple volumetric and qualitative analysis. Simple organic preparations, reaction of functional groups and physical determinations.

PHY 101: General Physics I (2 Units)
(Mechanics, Thermal Physics and Waves) Space and Time, Units and dimension, Kinematics; Fundamental Laws of Mechanics, statics and dynamics; work and energy; Conservation laws. Elasticity; Hooke's law, Young's shear and bulk moduli, Hydrostatics; Pressure; bouyance, Archimedes' Principles., Surface tension; adhesion, cohesion, capilarity, drops and bubbles. Temperature; heat; gas laws; laws of thermodynamics; kinetic theory of gases. Sound, Applications.Measurements, Units and Dimensions. Linear motion. Relevance of linear kinematics to science and physiological affects of accelerations. Motion in a circle and simple harmonic motion. Gravitation, statics and hydrostatics, elasticity, friction, viscosity and surface tension. Heat, temperature, thermometers. Expansion of solids, liquids and gases. Gas exchanges in terrestrial organism. Heat transfer, change of state. Heat regulation in animals, low temperature in biology and in medicine. Waves and resonance ultra sound and its application. Practicals: General measurements and error analysis, simple experiments in mechanics and properties of matter. Heat and thermodynamics. Kinetic model of gas, A model for solid. Properties of metals

PHY 105/PHY 106: General Physics Laboratory I & II (1 Unit each)
This laboratory based course emphasize quantitative measurement, the treatment of measurement and graphical analysis. A variety of experimental techniques will be employed. The experiments include studies of maters, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat, viscosity, etc. covered in PHY 101 & PHY 102

MTH 101: General Mathematics I (3 Units)
(Algebra and Trigonometry) Real number system: simple definitions of integrals, rational and irrational numbers. The principle of mathematical induction. Real sequences and series: elementary notion of convergence of geometry, arithmetic and other simple series. Theory of quadratic equations. Simple inequalities: absolutes values and the triangle inequality. Identities, partial fraction. Sets and subsets: union, intersection, compliments. Properties of some binary operations of sets: distributive, closure, associative, commutative laws with examples. Relations in a set: equivalence relation. Properties of set functions and inverse set functions. Permutations and combinations. Binomial theorems of any index. Circular measures, trigonometric function of angles of any magnitudes. Addition and factor formulae. Complex numbers: algebra of complex numbers, the Argand diagram, De Moivre's theorem, n-th root of unity.

CSC 104: Introduction to Computer Science (2 Units)

History of Computer Science and their generations; Computer Hardware; functional components Modern I/0 unitsThe meaning of a computer origin, classification: Analog, Digital and Hybrid. Types of Digital computers: mainframe, mini and microcomputer models of digital computers, modes of computer operations. The generation of computer types, the meaning of a programme and a "job". The two levels of computer software: The high-level and low-level. The computer and the language levels. Examples of systems software, Interpreters, compilers, and translators. The function of system software; the functional units of a digital computer; Examples of application software packages. Data processing and data processing centers. Criteria for using a computer. Type of computer users' interface. The types of printers. Introduction of the internet.

BIO 102: General Biology II (3 Units)

Levels of organization. Origin and History of classification. Principles of Binomial nomenclature. Hierarchical classification. Molecular classification of bacteria. structure, morphological features and chemical nature of viruses. Kingdom monera; Habitat, structure and morphological characteristics and life cycle of; Cyanobacteria, Archaebacteria, Eubacteria. Kingdom Protista;- Habitat, structure and morphological characteristics and life cycle of protozoans, algae and slime moulds. Kingdom Mycota;- Habitat, structure and morphological characteristics and life cycle of; ascomyctes, deuteromyctes, zygomycytes and oomycytes. Kingdom Plantae- Habitat, structure and morphological characteristics of bryophytes, pteridophytes, gymnospermae and angiospermae. Kingdom animalia;- Invertebrate and origin of animal diversity. Symmetry, cephalisation and gastrulation. Habitat, structure and morphological characteristics and life cycle of porifera, cnideria, platyhelminthes, nermetines, rotifers, nematode, acanthocephalia, annelid, mollusca, Echinodermata, and chordate.

BIO 172: General Biology Practical (1 Unit)

Testing for the presence of food substances, Diffusion and osmosis experiments. Observation of cells and tissues of selected plants and animal species. Investigations on physiological processes affecting photosynthesis. Observation of mitosis in onion bulb. Observation of cyst and ova of parasitic worms. Observation of fungi hyphae, and spores, bacteria cells, protozoan specimens and algae. Observation of Plant specimens. Observation of invertebrate animal specimens. Preparation of microscopic slides. Basics of photometry, colorimetry, chromatography, electrophoresis.

CHM 122: Organic Chemistry I (1 Unit)

Historical survey of the development and importance of organic chemistry. IUPAC nomenclature and classification of organic compounds. Homologous series Elemental analysis and molecular formula, structural Isomerism Isolation and purification methods concept of functional group resonance and aromaticity. Electronic theory in organic chemistry (brief). Saturated and unsaturated hydrocarbons, cyclic hydrocarbons, alcohols, alkyl halides, ethers, aldehydes and ketones, carboxylic acids, amines and aromatic compounds, comparison on phenols with alcohols.

CHM 172: General Practical Chemistry II (1 Unit)

More on theory and practice of simple volumetric and qualitative analysis. Simple organic preparations, reaction of functional groups and physical determinations.

MTH 102: Elementary Mathematics II (3 Units)

(Vectors, geometry and dynamics) Types of vectors: points line and relative vectors. Geometrical representation of vectors in 1-3 dimensions. Addition of vectors and multiplication by a scalar. Components of vectors in 1-3 dimensions: direction cosines. Linear independence of vectors. Point of division of a line. Scalar and vector product of two vectors. Simple application. 2-dimensional coordinate geometry: straight lines. Angle between two lines. Distance between points. Equations of circle. Tangent and normal to a circle; Properties of parabola, ellipses, hyperbola, straight lines and planes in spaces; direction cosines; angle between lines; and between lines and planes; distance of a point from a plane; distance between two skew lines.

PHY 102: General Physics II (3 Units)

(Electricity, Magnetism and Modern Physics) Electrostatics; conductors and currents; dielectrics; magnetic fields and induction; Maxwell's equations; electromagnetic oscillations and waves; Applications. Propagation of light at plane and curved surfaces. The human eye photosensitive pigments in the eye, colour vision and the insect eye. Optical instruments: Ophthalmoscope and compound microscope. Radioactivity and useful effects of radiation. Current and static electricity, introductory magnetism and alternating currents. Introductory atomic physics and electronics. Practicals: Vibrations, Wave and Optics Magnetism

SECOND YEAR

GST 222: Peace Studies and Conflict Resolution (2 Units)

Basic studies in peace studies and conflict resolution, peace as vehicle of unity and development, conflict issues, types of conflicts, e.g. ethnic/ religious/political/economic conflicts, root causes of conflicts and violence in Africa, indigene/settler phenomenon, peace building, management of conflict and security, elements of peace studies and conflicts resolution, developing a culture of peace, peace mediation and peace keeping, alternative dispute resolution (ADR) Dialogue/Arbitration in conflict resolution, role of international organization in conflict resolution e.g. ECOWAS , African union, united Nations etc.

GST 215: Introduction to Entrepreneurial Skills (2 Units)

Possible business opportunities in Nigeria. Some of the ventures to be focused upon include the following; 1. Soap/detergent, tooth brushes and tooth paste making 2. Photography, 3.Brick, nails, screws making 4.Dyeing /Textile blocks paste making 5.Rope making 6.Plumbing 7.Vulcanising 8.Brewing 9.Glassware production 10.Paper production 11.water treatment/conditioning/packaging 12.Food processing/ packaging/ preservation 13.Metal working/fabrication-steel and aluminum doors and windows 14.Training industry 15. Vegetable oil/salt extractions 16. Fisheries/Aquaculture 17.Refrigeration / Air conditioning 18.Plastic making 19. farming(crop) 20.Domestic electrical wiring 21.Radio/TV repairs 22. Carving 23.Weaving 24.Brick laying/Making 25.Bakery 26. Tailoring 27. Iron welding 28. Building drawing 29. Carpentry 30. Leather training 31. Interior decoration 32.Printing 33, Animal husbandry (poultry, piggery, goat etc). 34.Medial craft, blacksmith, tinsmith etc. 35. Sanitary wares 36.vehicle maintenance 37. Bookkeeping.

BCH 201: General Biochemistry I (3 Units)

Historical perspectives of biochemistry. The living cell; organization and molecular architecture, types of cells and their characteristics. The structure, size and functions of organelles. Biomolecules and the origin of life. The structural units of macromolecules- structures and functions of amino acids, monosaccharides, glycerol, fatty acids and nitrogenous bases. Inorganic synthesis of building units. Chemistry of amino acids, proteins and their derivatives. Measuring techniques in biochemistry-cell fractionation, chromatography (paper, thin layer, column, HPLC etc) calorimetry, spectrophotometry etc. Classification and hierarchical organization of proteins- primary, secondary, tertiary, and quaternary structures of proteins (with examples); determination and biochemical applications of the structures. The physical and chemical properties of water; acidity and alkalinity, pH, pOH, pKa, pKb values and their effect on cellular activities; buffer solutions- preparations of buffer solutions. The nature, classification and function of enzymes; introduction to enzyme kinetics.

Pre- requisite: BIO 111, BIO 122, CHM 111, CHM 112, CHM 122, CHM 123
Recommended Texts: 1. Principles of Biochemistry by Lehninger, 6th Edition (Worth Publishers) 2. Outlines of Biochemistry by Conn & Stump 4th Ed. (Wiley

BCH 202: General Biochemistry II (3 Units)

Structure and Organization of Biological Membranes. Mitochondrial electron transport and oxidative phosphorylation. Photosynthesis: Photoreceptor pigments, light and dark reactions of photosynthesis to include photosystems I and II, cyclic and non-cyclic photophosphorylation and a simple treatment of CO_2 fixation. Metabolism of Lipids: Digestion and absorption of lipids. Role of lipoproteins in lipid transport. Metabolism of lipoproteins in health and disease. Storage and mobilization of energy stores in adipocytes. Fatty acid formation; Introductory bioenergetics. Energy rich compounds. The role of ATP in energy exchange reactions. Oxidation-reduction. Simple calculations based on these concepts. Carbohydrate Metabolism: Digestion and absorption, in G.I.T. Glycolysis, citric acid, pentose phosphate and glyoxylate cycles. Gluconeogenesis and a brief outline of glycogenolysis and glycogenesis. Metabolism of amino acids and proteins: Digestion and absorption of protein in the G.I.T. The concept of nitrogen balance and essential amino acids. Amino acid catabolism to include the cellular strategies for deamination and the fate of the C-skeletons; Significance of glutamine and alanine cycles. Urea synthesis. A brief outline of biotransformation processes and detoxification strategies in the metabolism of xenobiotics.

(Pre-requisite BCH 201)
Recommended Texts: 1. Principles of Biochemistry by Lehninger, 6th Edition (Worth Publishers) 2. Voet and Voet (2012): Biochemistry 4th Edition, (Wiley)

BCH 204: Functional Biochemistry (2 Units)

An introduction to biochemical information flow: Strategies of signaling (physical and chemical) presented in a hierarchical fashion. Biochemistry of the Visual process: Vertebrate photoreceptors, rhodopsin and visual excitation. Lens cataract and night blindness. Composition of muscle and biochemistry of muscle contraction. The central dogma of molecular biology. Evidence for DNA as the carrier of genetic information and a outline of replication, transcription and translation. Hormones and neurotransmitters as chemical mediators of signals in plant and animals. An outline of the physiological actions of auxins, gibberellins, cytokinins, insulin, PTH, estrogens and testosterones. Ligand-gated and voltage-gated ion channels in the

transmission of nerve impulse (action potential, acetylcholine and other neurotransmitters e.g. GABA, serotonin, norepinephrine). Signal transduction cascades to highlight the roles of cAMP, IP3, diacylglycerol and Ca^{2+} ions in sensing and processing stimuli.
(Pre-requisite BCH 201)

Recommended Texts: 1. Principles of Biochemistry by Lehninger, 6th Edition (Worth Publishers) 2. Voet and Voet (2012): Biochemistry 4th Edition, (Wiley)

BCH 224: Membrane Biochemistry (1 Unit)
Structure, composition and functions of biological membranes- lipids, proteins and carbohydrates. Biogenesis- isolation, characterization and classification of membranes; chemistry and biosynthesis of membranes; molecular organization of membrane components; membrane dynamics- phase transition, motion of membrane components, heterokaryon membrane fusion- exocytosis, endocytosis, phagocytosis, pinocytosis; Transport across membrane- simple and facilitated diffusion, exchange diffusion, symport, uniport, passive transport, active transport- free energy of transport, primary and secondary active transport systems. Classification of ATPases, ion gradient for transport, ion- selective channels, acetylcholine receptor, porins etc; defective ion channel; signal transduction; features- gated ion channels (electrical signaling); ligand- gated ion channel; nicotinic acetylcholine receptor; voltage- gated ion channel; neuronal action potential; receptor- enzymes signal transduction- tyrosine specific protein kinases, insulin- receptor protein kinase, guanyl cyclase; G- protein coupled receptors: beta- adrenergic receptor- epinephrine. cAMP signaling, diacylglycerol and IP3 signaling; calcium signaling. Sensory transduction in vision, olfaction and gestation. Transport of sugar and amino acids. Ionophores.
(Pre-requisite BCH 201)

Recommended Texts: 1. Biology of cell membrane by Chairbone and Weissman.
2.. Membrane molecular biology by Fox, C.F. & Keith, A. 2. Foundation of membrane Biochemistry Etim *et al*., (2011)1st Edition, (First Born Investment)

BCH 228: Bioenergetics(Pre-requisite BCH 201) **(1 Unit)**
First and second laws of thermodynamics. Concept of Gibbs free energy and the basic principles of biological energetics. Entropy, high- energy compounds, Standard free energy change and its relationship to the equilibrium constant. Hydrolysis of ATP, thioesters and high energy compounds. Oxidation- reduction reaction; reduction potential, standard reduction potential and its measurement, electron transport system and oxidative phosphorylation, Mitchell chemiosmotic theory, regulation of ATP production. The energetics of coupled reactions, glycolysis, TCA cycle, mitochondrial photosynthesis electron transport, oxidative/photosynthetic phosphorylation.
(Pre-requisite BCH 201)

Recommended Texts: 1. Principles of Biochemistry by Lehninger, 6th Edition (Worth Publishers). 2. Thermodynamics of Biochemical Reactions by Robert A. Alberty (John Wiley and Sons Publication)

MCB 211: General Microbiology (3 Units)
Basic principles and methods of sterilization; control of microorganisms by physical methods: heat, filtration and radiation; chemical methods: phenolics, alcohols, halogens, heavy metals, quartenary ammonium compounds, aldehydes and sterilizing gases; evaluation of antimicrobial agent effectiveness. Principle and functioning of LAF. General principles in: preparation of culture media; types of culture media: simple media, complex media, synthetic media, enriched media, selective media, indicator media, differential media, anaerobic media; Pure culture techniques: streak plate, pour plate and spread plate method; maintenance of pure culture; methods of preservation of various microbes. Principles of Microscopy: Staining techniques: Simple, Gram, Capsule, Flagella, Endospore, Nuclear, Acid fast. Specimen preparation and basic principles for the examination of microbes by light, phase contrast, dark field, confocal, fluorescent and electron (transmission and scanning) microscopy; Micrometry and microdensitometry. Basic principles of Colorimetry and Spectrophotometry; Fluorimetry, Flame photometry and atomic absorption Spectrophotometry; Chromatography (paper, thin layer, column, partition, gel filtration, ion-exchange and affinity chromatography); GLC and HPLC.

BIO 211: Introduction to Genetics (2 Units)
History of genetics. Pattern, particle and principles of heredity (monohybrid and dihybrid inheritance). Complete, incomplete dominance and co dominance. Mendels inheritance in human: Multifactorial inheritance. Sex determination, Sex linkages, Eukaryotic chromosome and theory of inheritance. Detail structure of DNA, mechanism of DNA replication. Basic and normal control of cell division (meisosis and mitosis). Replication of DNA, Genes expression (mutation, transformation and protein synthesis). Genetic recombination. Gene linkages and Gene mapping. Locating of Genes along a chromosome. Direct detection of genotypes. Genetic analysis if populations and how they evolve (Heritable and non heritable characteristics, quantitative inheritance). Structure and organization of Drosophilia genome, sex determination in Drosophilia. Diseases at the level of the

gene (genic mutations), Recessive Disorders (homozygote recessive aa), blood clotting problems. Diseases due to recessive allele - sex-linked; Sickle-cell anemia. Phenylketonuria ; Galactosemia . Syndromes and Chromosomal disorders. Chromosomal rearrangements and Genetic Disease. Methods of Detection-Pedigree analysis. Origin of life on earth. Concept and theory of evolution.

CHM 221: Organic Chemistry II (2 Units)

Pre-requisite CHM (122)

Factors affecting structure and physical properties of organic compounds; factors availability of electrons at the reaction site, including theory of organic chemistry, orbital theory and hybridization classification of reagents and their reactions, Aromaticity, Stereochemistry, methane, energy of activation and free radical substitution reaction in alkanes. Functional group chemistry, various organic reactions e.g. addition, free radical, elimination reaction, etc.

BIO 272: Biological Techniques (2 Units)

Preparation of microscope slides, biological drawings, microtomy, colorimetry, photometry, cytological techniques, chromatography, collection and preservation of biological specimens. Herbarium Techniques, experimental design.

STA 212: Statistics for Biologists (3 Units)

Principles of measurements. Sampling techniques. Presentation of data in descriptive statistics. Frequency distribution. Measures of central tendency: mean, median and mode. Measures of dispersion: Mean deviation and standard deviation. Correlation and regression: Scatter Diagram, Coefficient of Correlation, Rank correlation. Lines of Regression. Probability: Basic concepts related to probability theory, classical probability. Probability Distributions: Introduction and simple properties of Binomial, Poisson and Normal Distributions and their applications in biology. Testing of hypotheses: Some basic concepts, Errors in hypothesis testing; critical region, Students t-test for the significance of population mean and the difference between two population means; Paired t-test; Chi square test for population variance, goodness of fit and for the independence of two attributes in a contingency table; F-test for the equality of two population variance; Analysis of variance- One-way and two-way analysis of variance.

CHM 212: Inorganic Chemistry I (2 Units)

Chemistry of First row transition metals. Introduction to co- ordination chemistry including elementary treatment of crystal field theory. Comparative Chemistry of the following elements: (a) Ga, In, TI, (b) Ge, Sn, Pb, (c) As, Sb, Bi (d) Se, Te, Po. Elementary introduction to Organometalic Chemistry. Role of metals in biochemical Systems.

CHM 231: Physical Chemistry I (2 Units)

Kinetic theory of gases; Behaviour of real gases; The law of thermodyamics; Entropy and free energy; Reactions and Phase equilibria; Reaction rates; Rate laws; mechanism and theories of elementary processes; photochemical reactions; Basic electrochemistry.

CHM 271 &CHM 272: Practical Chemistry I/II (1 Unit Each)

Preparation of organic compounds such as bromonitro benzene, dinitrotoluene etc and other related compounds including their purification, separation of coloured compounds using chromatographic techniques eg. Paper and thin-layer chromatography; practice of solvent extraction technique for liquids etc, preparation of double salts e.g Ahem's, experiment drawn from foods, oil water and oil analysis.

Pre-requisite: CHM 122 and CHM 212

THIRD YEAR

BCH 371: Introduction to Enzymology (3 Units)

Definition of the Enzyme Concept: Introduction to enzymes science, a brief history. Characteristics of enzymes, comparison between enzyme and chemical catalyzed reactions. Enzyme types of specificity, the active site. Lock and key, induced fit, and transition state stabilization hypothesis. Effect of Substrate concentration, temperature, pH, ions and inhibitors on enzyme catalyzed reactions etc. Coenzymes: Structures and functions and roles and relationship to the vitamins. Classification and Nomenclature of Enzymes/Isolation and purification of enzymes from animal/plant tissues and microorganisms, etc. Kinetics of Enzyme Catalyzed Reactions: Catalysis and activation energy- transition state of reactions, Arhenius equation, calculation of activation energy and energy of denaturation; Michaelis-Menten equation Lineweaver-Burk plot and other transformations; Enzyme Inhibition; protein- ligand interaction, cooperativity, allosteric/regulatory enzymes, estimation of kinetic parameters-enzyme activities, Km, Vmax, Ki etc; zymogens activation, digestive enzymes etc.. Quantitative estimation of enzyme activity, purification tables and units of enzyme activity, isozymes. Recent Advances in Enzymology: Application of Enzymology in Medicine and Industry.

(Pre-requisite: BCH 201 & 202)

Recommended Texts: 1. Principles of Biochemistry by Lehninger, 6th Edition (Worth Publishers); 2. Understanding enzyme Palmer 3rd edition
3. Biochemistry. The Chemical Reactions of Living Cells. Metzler,4 D. E. 3rd Ed.

BCH 311: Metabolism of Carbohydrate (2 Units)
Degradation and digestion of carbohydrates - sugars, storage polysaccharides and cell walls. Reactions of sugars. Glycolysis, the Tricarboxylic acid cycle, the phosphogluconate pathway the glyoxylate pathway; the pentose phosphate pathway and the cori cycle: the calvin pathway. Gluconeogenesis and glyconeogenesis. Disorders of carbohydrate metabolism.
(Pre-requisite: BCH 201 & 202)

Recommended Texts: 1. Principles of Biochemistry by Lehninger, 6th Edition (Worth Publishers)

BCH 313: Metabolism of Lipid (2 Units)
Review of definition and classification of lipids: fatty acids, triacylglycerol, glycosylglycerols, phospholipids, sphingolipids, waxes, prostaglandins; lipid micelles, monolayers and bilayers. Lipid metabolism: Digestion, absorption and storage of fats; obesity genetic abnormalities in carnithine or carnithine acyl transferase. Refsum's disease, atherosclerosis, myocardiac infarction, lipidoses e.g. Gaucher's Disease. Fatty acid oxidation and synthesis, formation and degradation of ketone bodies. Synthesis of triacylglycerol, glycerophospholipids, sphingolipids, cholesterol and steroid hormones. Integration of lipid metabolism; acetic acid as central precursor for lipid biosynthesis.
(Pre-requisite: BCH 201 & 202)

Recommended Texts: 1. Voet and Voet (2012): Biochemistry 4th Edition, (Wiley)
2. Biochemistry of Lipids, Lipoprotein. and Membranes (4th) Vance and Vance (Eds 2002.)

BCH 315: Metabolism of Amino Acid and Proteins (2 Units)
Amino acids as building blocks of proteins; covalent backbone of proteins; amino acid sequence of proteins; isolation, fractionation, purification and characterization of proteins. Biological functions of proteins; protein degradation, deamination and transamination reactions; urea cycle; nitrogen metabolism; nitrogen fixation, glutamine synthetase in nitrogen metabolism. Amino acid biosynthesis and its regulation; defects in amino acid metabolism, synthesis of molecules derived from amino acids- porphyrin, Creatine, glutathione, other amino acids; nitrogenous excretory products- amino acid oxidation, production of urea; amino acid pool; nitrogen balance.
(Pre-requisite: BCH 201 & 202)

Recommended Texts: 1. Principles of Biochemistry by Lehninger, 6th Edition (Worth Publishers) 2. Introduction to Protein Science by Lukong *et al*., (2007) Kriscona Press

BCH 317: Metabolism of Nucleic Acids (2 Units)
Structure and Function: Nucleoside and nucleotides- classification, structure and reactions; properties of nucleotides- absorption spectra, tautomerism, phosphodiester bonds in nucleic acids, base pairing and hydrogen bonding Brief review of the chemistry and functions of nucleic acids. Genome organization and biosynthesis of proteins. Purine and Pyrimidines Organization: Nucleotide and nucleic acid synthesis, salvage and de- novo pathways and regulation; degradation of nucleotides, nucleic acid, purines and pyrimidines. Abnormalities in nucleic acid metabolism- xeroderma pigmentation and skin cancer; Lesch-Nyhan syndrome arthritis and gout etc
(Pre-requisite BCH 201 & BCH 202)

Recommended Texts: Biochemistry by Stryer, L.. 6th Ed.

BCH 361: Techniques in Biochemistry & Molecular Biology (2 Units)
Principles of Instrumentation: principles, methodologies and applications: Electrophoresis- cellulose acetate, agarose gel, starch gel, SDS- polyacrylamide gel; isoelectric focusing, detection, estimation of molecular weight of protein; Western, Northern and Southern blotting. Chromatography: types: paper, thin layer, adsorption, molecular exclusion, partition, affinity, ion exchange, gas- liquid, high performance, low pressure. Detection, quantification and analysis of biomolecules by chromatography. Spectroscopy: spectrophotometry, turbidimetry, nephelometry, atomic absorption, atomic emission, spectrofluorimeter. Centrifugation: differential, density, gradient, ultracentrifugation; analysis of sub cellular fractions. Radio-isotopy techniques: Nature of radioactivity and data analysis; ELISA; application in immunology and bioassays. Microscopy- light and electron microscopy, ion-probe analysis and video microscopy. pH measurement- Calomel and glass electrode. Ultra- filtration and dialysis.
(Pre-requisite: BCH 201 & 202)

Recommended Texts: 1. Principles of Biochemistry by Lehninger, 6th Edition (Worth Publishers); 2. Essential Techniques of Biochemical Analysis Anene *et al*., (2011) Kriscona Publishers; 3. Tools of Biochemistry by Cooper, T.G.. John Wiley & Sons N.Y.

BCH 363: General Biochemistry Laboratory I (1 Unit)
Introduction to Biochemistry Laboratory: General information about Practical Biochemistry. Collection of specimen; laboratory instructions; Quantitative and qualitative assays in biochemistry. Safety in laboratory experiments. pH Dissociation and Buffers: Relevance of pH and Buffering; pH indicators and pH meter; Acid-base titration. General Tests of Carbohydrates, Lipids, Vitamins and Proteins. At Least three experiments to be conducted for each class of molecules. Quantitative Analysis of Urine: At Least four experiments to be conducted. Quantitative Analysis of Blood/Serum: At Least four experiments to be conducted. Enzyme Assays: Enzymes and Isoenzymes; Estimation of amylase in plasma; Urease activity and the effects of inhibitors. Effect of pH, T^0, enzyme concentration, substrate concentration on the hydrolysis of Starch by Amylase. Demonstration of Some Techniques Used in Biochemistry: Electrophoresis, Chromatography, Cell Fractionation and Centrifugation.
(Pre-requisite: BCH 201 & 202)

MCB 333: Microbial Physiology and Metabolism (3 Units)
Dynamics of growth. Nutrition and energy metabolism of microorganisms. Effect of physical and chemical factors on growth. Biochemistry of various microbial processes such as transport, regulation and respiration. Biosynthesis of microbial products. Buffer preparation and standardization. Basic separation techniques in microbiology, dialysis, salting out, gel filtration, electrophoresis etc. Assay techniques for various metabolites including microbial enzymes, acids etc.

CHM 321: Organic Chemistry II (2 Units)
Alcohols and their reactions. Ethers and Epoxides. Carboxylic acids and their derivatives. Aldehydes and Ketones. Carbanion 1 and B-Unsaturated compounds, Carbanion II. Amines; Aromatic and Alicyclic Chemistry. Polyfunctional compounds. Heterocyclic Chemistry.

CHM 331: Physical Chemistry II (2 Units)
Chemical kinetics. Chemistry thermodynamics Law II and III of thermodynamics. Entropy conditions for equilibrium (Hemnholtz and Gribb free energies), Relation between free energy and equilibrium constant. Phase equilibrium, Phase compound and degree of freedom. Deduction of phase rule, application to one and two components systems. Nernst distribution Law, Clausius Clayperon equation. Troutons rule. Introduction to statistical thermodynamics properties of electrolyte.
Pre-requisite: CHM 213

FOURTH YEAR

BCH 411: Biosynthesis of Macromolecules (2 Units)
Structure and functions of macromolecules. Storage and structural polysaccharides; mucopolysaccharides, glycoproteins, bacterial cell wall synthesis of complex lipids, lippoproteins and nucleic acids.
(Pre-requisite BCH 311)

Recommended Texts: 1. Biochemistry by Stryer, 6th Ed. 2. Organic chemistry of biological compounds by Baker, R..

BCH 415: Metabolic Regulation (2 Units)
The endocrine system. Conditions, classes and experimental approaches to metabolic control. Integration of metabolic pathways to emphasize the relationship of Krebs's cycle to protein, carbohydrate, lipid and nucleic acid metabolism. Turnover rates and metabolic pools. Significance of compartmentation in metabolism. Regulation of enzymes of metabolic pathways- feedback inhibition vs. synthesis. Catabolite repression and product repression, the lactose operon and arabinose operon. Identification of different regulatory mechanisms in metabolic pathways.
(Pre-requisite BCH 311, BCH 313, BCH 315)

Recommended Texts: Biochemistry The Chemical Reactions of Living Cells 2d Ed by VoHansford,

BCH 431: Industrial Biochemistry (3 Units)
A short review of microbial physiology and genetics. A review of general metabolic pathways and application in industrial processes. Continuous culture methods, principles and applications. The chemostat and its application in industrial fermentations. Fermentations - alcoholic, amino acid antibiotics and other secondary metabolites. Primary and secondary metabolism. Process evaluation and development. Over production of metabolites - amino acids, taste enhancers, vitamms, toxin etc. Methods for screenmg and selecting micro-organisms of industrial importance. Induction of mutation in micro-organism and plants for the

purpose of over production; Strain selection/development and enhancement. Gene dosage and its application in industrial processes.
(Pre-requisite BCH 227, BCH 311 & BCH 371)

Recommended Texts: Biochemistry of Signal Transduction and Regulation 3d ed - Gerhard Krauss

BCH 441: Tissue Biochemistry (2 Units)
Biochemistry of muscles, kidney, liver, and adipose tissues. General metabolism of the brain and neuronal biochemistry. Biochemistry of reproductive tissues. Detoxification and excretion in tissues.

Recommended Texts: 1. Marks' Basic Medical Biochemistry 4th Ed 2012

BCH 443: Plant Biochemistry (2 Units)
Organization of plant cells, photosynthesis, alkaloids and flavonoids, Plant hormones. Biosynthesis of carotenoid Pigments, Biochemistry of Plant Development. The plant cell wall structure, formation and growth. Lignin formation. Free amino acids, pyrimidines, purines and nucleosides in plants. Metabolism of auxins, gibberelins and cytokinins. Synthetic growth regulators and herbicides. Structure - function relationship of plant hormones.
(Pre-requisite BCH 201 & 202)

Recommended Texts: 1. Heldt - Plant Biochemistry 3rd ed. 2. Biochemistry and Molecular Biology of Plants. B. Buchanan, W. Gruissem & R Jones Eds.

BCH 451: Pharmacological Biochemistry (2 Units)
Cellular metabolism in infected cells. Biochemical aspects of host-parasite relationships. Metabolic factors affecting chemotherapeutic agents. Theories of the mechanism of drug action. Drug resistances and other factors affecting drug efficacy. The physiological and biochemical action of some selected drugs. Nigerian traditional medicinal plants in the management and therapy of common ailments in Nigerian - malaria, sickle cell anaemia, common cold, hepatitis etc.
(Pre-requisite BCH 201, BCH 202 & BCH 321)

Recommended Texts: 1. Toxicological Chemistry and Biochemistry, Third Edition – Stanley E.N 3rd Ed.

BCH 433: Food and Nutritional Biochemistry (2 Units)
An introduction to the theory and application of physical and chemical methods for determining the constituents of food. Food processing, preservation and storage of traditional foods – root and stem tubers, fruits and fruit drinks, seeds and grains, green and vegetables. Food poisoning and intoxication; prevention and cure. Food nutrients; Energy values of foods and energy expenditure by mammalians. Nutritive value of foods - carbohydrates, fats, proteins, vitamins, mineral elements and water. Nutritional disorders, prevention and therapy. Nutritional status and nutritional requirements. Recommended dietary allowances. Assessment of nutritional status. Nutrient requirements in relation to Physical, activity and ageing, diet and disease, obesity and under nutrition.
(Pre-requisite BCH 201 & 202)

Recommended Texts: 1. Nutrition, "An integrated approach" by Pike, R.L. and Brown. M.L.
2. A biochemical approach in Nutrition by Freedland and Briggs.

BCH 481: Special Topic/Seminar in Biochemistry (2 Units)
Topics to cover in areas such as hormones, immunochemistry, oncology, brain biochemistry, plant, medical biochemistry, genetic engineering monoclonal etc. these may be taught or seminars may be given by academic staff and students.

BCH 453: Immunochemistry (2 Units)
Basic immunobiology, Antigens, antibodies and their reactions. Concepts and types of immunity (humoral and cell mediated) immunogens, antigens and haptens. Classification and structural motifs of immunoglobulins. Antibody combing sites and structure function relationship, complement system and fixation, organization of immunoglobulin genes, Molecular basis of antibody diversity. Production, detection and uses of monoclonal antibodies. Concepts of clinical immunology; immune tolerance factors affecting immune response. Innate and acquired immunity- features, mechanisms and determinants; cells and organs of immune system; evolution of immune system. Antibody structure and function- classification, polyspecific and monoclonal. Lymphocytes- isolation and function. Antigen- antibody interaction- characteristics, precipitation, lattice theory, agglutination and haemagglutination. Detection of antigens- antibody reaction- immunodiffusion, immunoelectrophoresis, fluorescence quenching, radioimmunoassay. Enzyme-linked immunosorbent assay (ELISA), fluorescent antibody technique. Hypersensitivity, allergy and causes. The major histo-compatibility complex (MHC), MHC restriction, cytokines, the

complement system and its activation. Immunologic tolerance, autoimmunity and immuno-deficiency, transplantation, immunology of parasitic diseases.
(Pre-requisite: BCH 201, 202 & BCH 315)

Recommended Texts: 1. Voet and Voet (2012): Biochemistry 4th Edition, (Wiley)
2. Essential Immunology by Roitt (Blackwell Scientific Publications).
3. Understanding Basic Immunology & Immunochemistry by Awah *et al*.

BCH 472: Advanced Enzymology (2 Units)
Steady state enzyme kinetics. Transcient kinetic methods. Chemistry of enzyme catalysis. Regulatory enzymes. Molecular models for allosterism. Multienzyme complexes. Enzyme assays. Criteria for determining purity of enzymes. Enzyme reconstitution. Regulation of enzyme activity and synthesis
(Pre-requisite BCH 371)

Recommended Texts: 1. Enzyme structure & mechanism by Fersht. 2. Fundamentals of Enzyme Kinetics by Cornish-Bowden.
3. Quantitative Problem in Biochemistry by Dawes, E.A.

BCH 474: Biotechnology & Genetic Engineering (3 Units)
Replication, transcription and translation- a brief review. The genetic code and its relationship to cellular functions. DNA replication in a cell- free system. Genetic transformation, transfusion and conjugation. Gene mutation; mutagenic agents and their application to gene transfer. Gene mapping, structure of eukaryotic genome. Recombinant DNA and its application- genetic engineering for improved plants and animals, metabolic engineering, protein engineering, and antibody engineering. Gene cloning and gene therapy. Hybridomas
(Pre-requisite: BCH 413)

Recommended Texts: 1. biology - introduction to molecular genetics and genomics

BCH 462: Advanced Biochemical Methods (1 Units)
The purpose of this course is to familiarize students with operations of latest biochemical equipment and with methods of research, assimilation and dissemination of information. Students will go therefore round lecturers and laboratories housing specialized equipment with the aim of exposing them to such equipment under the supervision of lecturer. Part of the course will also cover the effective use of the library, preparation of dissertations or theses, papers for journal publications and journal reviews. Special assignments and essays will be given to students.
(Pre-requisite: BCH 363)

Recommended Texts: 1. Biochemical Experiments by Bruening, G. Criddel, R.

BCH 464: Introduction to Biochem. Lit. and Phil. of Science (2 Units)
Introduction to Biochemical literature will involve one hour lecture and library study for two hours per week. Students will be given assignments which they are expected to complete during one or two library studies and present a written discussion in class. History and philosophy of science will consist of lectures on the growth and development of biochemistry research. Effective use of library for literature search for preparation of dissertations, theses and papers for publications in scientific journals. Citing of reference and how to carry out a literature search. Development of the science of macromolecules. Modern trends in natural products chemistry. Development of Immunology and Chemotherapy. The search for information continues. Database and computer search techniques. Presentation of case studies/long essays. The middle age scientists to present day experimentalists. Relationship between science, religion and philosophy. Use of chemicals and biological abstracts. How old is Biochemistry. From vitamin to intermediary Metabolism. Assignment and long assays. Landmark in vitamin and hormone research. Growth of microbiology and genetics/Long Essays. Characteristics of a scientific paper. Making summary. Progress in biochemistry in the last 50 years. The Nobel Foundation and its role for modern day science.

BCH 454: Bioinorganic Chemistry (2 Units)
Relationship between the physicochemical properties and biological functions of inorganic ions. Ligand complexes and their biochemical significance. Electrolyte metabolism. Nitrogen fixation and sulphur cycle.
(Pre-requisite BCH 311, BCH 313& BCH 315)

Recommended Texts: 1. Analytical Biochemistry 3rd ed - David Holme, Hazel Peck
2. Inorganic Biochemistry of Iron Metabolism From Molecular Mechanisms to Clinical Consequences, 2nd Ed. By Robert R. Crichton

BCH 476: Biochemical Reasoning (1 Unit)
NOTE: Evaluation and design of experimental biochemistry from available information and data. Analysis, interpretation and inference drawing from biochemical research data from literature. The course approach should involve take-home assignments to be discussed later in class. Solving numerical problems should be extensively treated in this course. Evaluation and design of experimental biochemistry from available information and data. Analysis, interpretation and inference drawing from biochemical research data from the literature. Topics to cover include: Protein/nucleic acids Chemistry and Forensic Science. Enzymology. Membrane Phenomena. Carbohydrates. Molecular Biology. Clinical Biochemistry. Lipids

BCH 492: Research Project (6 Units)
Independent research findings into selected areas/topics of interest to the academic staff. Students will be required to carry out literature survey on topics, perform experiments and produce short reports. Students will be subjected to both seminar and oral examination on the project undertaken.

BCH 482: Biochemical Toxicology (2 Units)
Biochemical toxicology, definition and scope, absorption and distribution; toxicokinetics, metabolism of toxicants; comparative toxicology; physiological factors affecting metabolism of Zenobotics elimination of toxicants and their metabolities, toxicant-receptor interactions, genetics poisons' chemical carcinogenesis; trace element toxicity, hepatotoxity.
Pre-requisite: BCH 451)

Recommended Texts: 1. Molecular and Biochemical Toxicology

BCH 467: Medicinal Chemistry (2 Units)
Biochemical pharmacology: Introduction. Absorption and distribution. The blood-brain barrier; placental transfer of drugs. Biotransformation of drugs their conjugation and excretion. Factors affecting metabolism. The micosomal enzymes system. Drug-receptor interactions. Bioassay of drugs, pharmacokinetics, the importance of plasma levels of a drug. Drug discovery, design and development. Drug Action: Neurohumoral transmission: Neuromuscular and ganglionic blockade sympathominetics; adrenaline receptors; adrenergic neuron antagonists. Autocoids; Histamine; Serotomin; polypeptides; prostaglandins and related substances; antiallergic, anti-inflammatory and antipyretic agents. Generally-acting drugs. Opiates, receptors and antagonists; Dopamine receptors and antipsychotic drugs; antidepressants; anti-anxiety drugs. Selective toxicity; The basis of selective toxicity. Survey of host defence mechanisms and the use of chemotherapy. The bacterial cell membrane, effect on its permeability – role of antifungals. Folic acid and the role of anti-metabolites. Drug resistance, protein synthesis and its interference. Protozoology – parasites, life cycle of material parasite – other example of protozoal infestations. Viruses, their definition and classification. The biochemistry of viral replication. The role of interferon and other antivirals. Neoplasia – role of anticancer agents.

Recommended Texts: 1. An Introduction to Medicinal Chemistry Graham L Patrick

3. DEPARTMENTAL REGULATIONS

3.1 Teaching Method
Lectures are combined with a novel pedagogic technique that involves formal and informal cooperative learning in which students play major roles. Encouraged emphasis are made in concept and reasoning. Questions and discussion are stressed during the lecture time.

3.2 Role of Instructors

The instructor is responsible for all materials in the lectures and is committed to providing students with an excellent and challenging course. Students who have problems in understanding the lectures or getting difficulties in preparing for exams/test should contact the lecturer right away and not at the end of the semester. The lecturers will encourage students but not force them to remain in class even if they are failing. They will use different pedagogic approaches to make sure majority of the students have understood the lecture. No lecturer will give a make-up test for students without justifiable reasons for not being in class.

3.3 Class Attendance

Attendance at lectures is imperative for students to understand the material covered in each course. Lecturers expect that students attending their lectures should focus their entire attention upon the lecture. As usual, disruptive students will be asked to leave class. Regular attendance in class is an important factor that will increase the probability that students will [a] develop a better understanding of the material, [b] be able to demonstrate that understanding on exams and [c] earn a higher grade in class. Students should note that examinations may include materials, covered in lectures that are not in the textbook or class notes. Students who failed to attend classes are not allowed to disturb lecturers with questions in concepts that were explained during the missed lectures. Attendance in class, motivation and good preparation for exams are the key factors toward succeeding in the Department of Biochemistry. Students are advised to make serious effort to attend to class particularly those getting low grades. However, students who do not study or attend classes should not complain to anybody for low scores. No student should ever go to a lecturer's office at the end of the courses asking for higher scores. Such act will tantamount to examination malpractice. Both the lecturer and student shall face the consequence for such act. If a student intends to graduate with his batch, he should always read the course syllabus carefully prepare well and plan accordingly.

3.4 Role of Student

The Faculty of Science lecture timetable provides time and venue for different lecturers in the various departments. A class always starts and finish on time. Students are advised to make every effort to enter the class before the lecturer in order not to distract other student's attention.

Please do not leave the lecture hall without the consent of the lecturer. Lecturers shall only permit students who fall ill or have some other unavoidable circumstances to leave the hall. Students, who have appointments with any school authority such that they need to leave early, should kindly inform the lecturer of such matters before the commencement of the class. Such students should sit in a seat at the back of the classroom. When leaving the class, such students should minimize distracting others.

Students should be considerate of their fellow students and the lecturer by making every effort not to cause unnecessary noise. Students are expected to make comments and ask reasonable questions in class. Lecturers will always endeavor to address them as they are raised. Food and beverages are not allowed to be consumed in class. However, students who have difficulty or disability that requires recording of lectures must get approval from the lecturer. All cellular phones and beepers should be switched off during classes. Social conversations are not allowed in class.

3.5 Guides for Effective Note Taking

a) Take a close look at note-keeping. Good notes are extremely important!
b) Learn to take good class notes and improve your note-taking skills
c) Listen for speaker's organizational structure during lecture
d) Review class notes each and every day
e) Take your own notes during lecture
f) Identify central ideas in textbook passages
g) Use a system that shows the relationship among the facts rather than a list of facts
h) Vary the format of taking notes according to the content of the material
i) Consolidate information taken from several sources into a master set of notes
j) Consistently update and summarize the information learned
k) Use abbreviations for long words
l) Be organized and meticulous in keeping your notes

3.6 Study Skills

a) With time, concentration, and some effort it is easy to make good grades happen
b) Study time must be schedule every day!
c) Make up a "to-do" list for tomorrow and set priorities.
d) Realistic study goals must be set each and every day.
e) Make up a weekly list of things to accomplish
f) Reward yourself for finishing items on your "to-do" list.
g) Create your own study area for serious studying.
h) Class attendance is very important.
i) Set your purpose before beginning to read or study.

j) Break time into manageable units to increase productivity.
k) Keep track, on paper, of the amount of time you've spent studying and what you accomplished.
l) Pace study to allow adequate time for reviewing and memorizing.
m) Memorize only after understanding information.
n) Reinforce information through timely repetition at intervals ranging from the same day to several weeks after.
o) Practice remembering the information (reciting and writing) without the aid of notes, text, internet notes, or study sheets. Remember, you won't have these during the exam.
p) Use organized system for learning new vocabulary words.
q) As you survey a reading selection, formulate questions you will answer as you read. (Who, What, Where, How, Why, Significance).
r) Form a study group and spend time asking each other questions and "teaching" one another the most important material.
s) Don't fall behind! Talk to your professor, go for councelling.

3.7 Test Skills

a) Predict test questions while studying and be certain you can answer them to ensure you know the material
b) Read test instructions!
c) Read questions carefully and identify key terms
d) Attempt to define key terms in a question before working through the question
e) Determine the intent of the test question without over-interpretation
f) Use a problem-solving strategy rather than guessing when uncertain of an answer
g) Apply consistent logic to answer choice within a test question

3.8 Laboratory Preparations

For best performance of laboratory exercises and best understanding of the materials, students should approach the exercises in an organized fashion. This includes reading each exercise and writing laboratory preparation report on what they are going to do during class before going to the laboratory. Such reports should include background materials as well as a statement of the objective or purpose of the exercise.

3.9 Laboratory Notebook

Students are expected to maintain an up to date notebook of all laboratory exercises. Such note books should use the same format as the laboratory report, but are not expected to be vigorous. However, for convenience and in order to maintain good records, the laboratory note book has been incorporated into the manual. Laboratory exercises should be integrated into the note book, and should be supplemented to maintain a full record of your activities in the laboratory, as well as the results you obtain, the interpretations and conclusions made from them.

3.10 Laboratory Reports

Students shall be required to generate five formal laboratory reports during the semester. Exercises to be based on shall be listed in each laboratory outline. Each report should have a name, be well integrated and follow the format specify by the subject master. Generally laboratory reports in biological sciences are organized as follows:

1. Introduction

a) Background: What are the scientific bases of the approach or techniques used- how does it work.
b) Purpose: What will / did the experiment accomplished.

2. Materials and methods

a) Materials: What were the essential supplies used.
b) Methods: Step wise explanations of how the experiment was performed.

3. Results

a) Tables or graphs that present the data in the most appropriate format for later interpretation
b) Text that explains the trend of the results contain in the table.

4. Discussion

It involves stating inferences from the practical work. Students are expected to state clearly how their findings relate to current trends in microbiological discoveries. When possible some citations may be given to support of disproof the findings.

3.11 Examination Patterns

Semester examinations shall be conducted after 15 – 17 weeks of studies. Examinations time table shall be published a month to the examination.

(a) Candidates shall normally be required to take examinations in all courses for which they have registered at the end of the semester in which the courses are completed.

(b) Examination questions shall be set based on the prescribed syllabus (entire course content).

3.12 Industrial Training: Final year students shall be examined for the six months Industrial Training in three components; the Log book (30 marks), Detailed and comprehensive Report (30 marks) and closed door oral examination before a panel of lecturers (60 marks). The examination exercise shall be conducted on or before the fourth week of resumption of first semester of study

3.13 Seminar: Students are evaluated for seminar in Biochemistry in the first semester of 400 Level. It is usually based on two components; oral power point presentation before staff and students of the Department (70 marks) as well as evaluation of submitted report by student's supervisor (30 marks). Seminar is usually conducted in the first semester.

3.13 Research project: Each 400 level shall be allotted a topic on which he/she shall carry out practical research for a minimum of three months. Research projects shall be appraised through; project proposal, internal oral evaluation and final oral examination before an External Examiner. The pass mark shall be D or a grade point of 1.5.

4. CONDUCT AT EXAMINATION

Candidates for each examination are required to comply with the following regulations.

i. All candidates shall arrive at the designated examination hall 30 (thirty) minutes before the scheduled time.

ii. No candidate shall enter the hall unless asked to do so by the invigilator.

iii. When asked, a candidate shall enter the exam hall with:
   a) Current identity card
   b) Pen(s), Pencil(s)
   c) Calculator (but not a programmable type)
   d) Ruler and
   e) Any other material (tables, graph paper, drawing sheet etc) that may be permitted by the chief invigilator.

iv. If a candidate reports for an examination without his current identity card, he shall report to the Chief Invigilator with a recent passport photograph. The Chief Invigilator after authenticating the photograph shall fix it on the candidate's answer booklet. At the end of the examination, the script shall be forwarded to the University Senate Examination committee before whom the candidate reports for clearance within 2 (two) working days, with his current identity card. The passport shall be returned to the student and the script released for marking. If it is discovered however, that the person who wrote the examination is not the owner of the identity card, it becomes a case of impersonation.

v. No candidate shall have any other material in his possession, even a private letter while inside the exam hall.

vi. The invigilators shall assign seats to candidates. A candidate shall neither choose a seat for himself nor refuse a seat assigned to him by the invigilator.

vii. Where possible, no two candidates writing the same examination paper shall sit next to each other in the examination hall.

viii. Any invigilator reserves the right to inspect caps, head ties, underwear and sun-glasses of the candidates.

ix. No candidate shall be allowed to either enter the exam hall 30 (thirty) minutes after the examination has started or leave the hall within the first thirty minutes of the examination.

x. No candidate shall be permitted to borrow or lend any material such as ruler, calculator, pen, pencil, eraser, etc during an examination except with the express permission of the invigilator.

xi. Candidates are not allowed to tear any paper from either the question papers or answer booklets for any purpose including rough work. Any such work must be done on the answer booklets and then cancelled. No rough work is permitted on the question paper, on the desk, palm or anywhere else.

xii. No candidate shall leave his seat during an examination unless authorized by the invigilator.

xiii. Candidates wishing to draw the attention of the invigilators to any particular issue shall do so by raising their hands and not by rising from their seats, or by making sounds of any sort.

xiv. All candidates, within the first five (5) minutes of the examination shall write their registration number on both the question papers and the answer booklets. Nothing else, shall be written on the question paper.

xv. No alteration or cancellation is allowed in the students' registration number. If any mistake is made, the chief invigilator shall be notified before any correction is made.

xvi. Candidates shall ensure that they enter the question number attempted in the appropriate columns on the front page of the newer scripts.

xvii. Every candidate shall sign the Students Examination Attendance Register at the start of each examination.

xviii. On submission of the answer script after the examination, each candidate shall sign off on the Students Examination Attendance Register. For the avoidance of doubt, every student is responsible for the proper return of his examination script to the invigilator in the examination hall.

xix. Smoking, eating or drinking is prohibited in the examination hall.

5. EXAMINATION MISCONDUCT

Any departure by either staff or students from the laid down examination regulations constitutes examination misconduct for staff as well as for students in and outside the Examination hall.

5.1 Examination Misconduct Committed in the Hall

- **i.** Every alleged case of examination misconduct arising during an examination shall be recorded on the prescribed Examination Misconduct Report form filled in duplicate.
- **ii.** The Examination Misconduct Report Form shall be completed before the student involved is allowed to continue writing. The student's examination time shall not be extended.
- **iii.** An allegation of a case of examination misconduct shall not constitute enough grounds for a student not to be allowed to complete writing the examination except where his continued presence within the exam hall endangers peace and good order.
- **iv.** The chief invigilator shall package the completed Examination Misconduct Report Forms along with the relevant answer scripts and any supporting materials, in a separate envelope for the Chairman of the Faculty Examination Committee.
- **v.** The Chairman of the Faculty Examination Committee shall collect all cases of examination misconduct at the end of each examination, make a report of them, and promptly submit them to the University Senate Examination Misconduct Committee through the Dean of Faculty who may retain the duplicate copy (only) of each Examination Misconduct Report Form.
- **vi.** On no account shall a report on an alleged case of examination misconduct be delayed for more than one (1) working day in the custody of any forwarding officer.
- **vii.** The University Senate Disciplinary Committee handles also all Examination Misconduct cases.

5.2 Examination Misconduct outside the Hall

Any suspected case of examination misconduct detected outside the examination hall shall be promptly reported in writing through the Head of Department to the Dean of Faculty who shall forward the case to the Case to the Chairman of the University Senate Examination Misconduct Committee within one (1) working day of the receipt of the report. The reporting officer shall send a copy of the report to the Chairman of the Faculty Examination Committee.

5.3 Penalties for Examination Misconduct by Students

Here are some misconduct with corresponding penalties as approved by Senate. The list is not exhaustive and Senate reserves the right to attend to it from time to time.

A) EXPULSION FROM THE UNIVERSITY:

Misconduct

- ***i.*** Impersonation (for both the impersonator and impersonated). However where the impersonator is not a student of Madonna University he/she shall be handed over to the Police. And if a student of the University impersonates anyone outside the University, he/she shall be expelled from the University.
- ***ii.*** Found with unauthorized answer scripts or written material in the examination hall.
- ***iii.*** Refusal to hand over suspected offending material(s).
- ***iv.*** Destruction of suspected offending material(s).
- ***v.*** Assaulting or fighting an invigilator or any other examination officer

B) REPEAT THE YEAR

Misconduct

- ***i.*** Failure to return an answer script after the examination.
- ***ii.*** Collaborative copying.
- ***iii.*** Exchanging answer scripts or written materials in the examination.
- ***iv.*** Tendering of any unauthentic document relating to exam.
- ***v.*** Refusal to sign the examination misconduct form.
- ***vi.*** Smuggling of question paper out of the exam hall.

C) AWARD 'F'

Misconduct

- ***i.*** Unruly behavior to the invigilator or any other exam officer.
- ***ii.*** Refusal to sign the Examination Misconduct Form when asked to do so.
- ***iii.*** Conviction in two (2) or more misconducts in (D) below.

D) WARNING

Misconduct

i. Writing before the start of an examination.
ii. Writing after the call for stop of examination.
iii. Writing things other than the registration number on the question paper provided and none of the misconducts in (a)ii above is committed.
iv. Talking to another student during an exam.
v. Looking into another student's answer script.
vi. Borrowing or lending any material in the examination hall.

5.4 Petitions on Examinations

Any student who feels victimized by any lecturer or an invigilator during examination should report immediately to the Vice Chancellor for proper investigation.

5.5 Staff Petition on Examinations

Every academic staff has the right to petition the Vice-Chancellor through the Head of Department and the Dean of his Faculty on any perceived unfair treatment/bad handling in connection with any aspect of the examinations in this University and advance copy shall be dispatched to the Vice- Chancellor.

i. The Head of Department shall within five (5) working days of its receipt submit the petition to the Vice-Chancellor.
ii. The Vice-Chancellor shall endeavour to dispose of the matter in the shortest possible time in order not to delay the publication of the students' results.

6. EXTERNAL EXAMINERS

6.1 Introduction

The external Examiner performs a most important quality control function in the University's examination process.

i. The External Examiner ensures that the University's avowed academic standards are duly reflected in the quality of question papers, the marking schemes, and students' projects. He/she shall submit an independent report to the Vice-Chancellor at the end of each external examination exercise.
ii. The External Examiner shall be a senior academic of a rank not below a senior lecturer and shall be external to the University. If in industry or in professional practice, he shall have attained such a senior academic rank prior to leaving University service. In any event, he/she shall possess evidence of academic currency in his field.
iii. The External Examiner's term of appointment shall be year by year for a maximum of three (3) years, after which he shall not be eligible for appointment until a period of three (3) years has elapsed from the end of his/her last appointment unless otherwise authorized by senate.

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7. OUTLINE OF PROTOCOL FOR WRITING INDUSTRIAL TRAINING REPORT, SEMINARS AND PROJECTS

7.1 INTRODUCTION

In order to graduate from the Department of Biochemistry with a Bachelor of Science (B.Sc.) honour, among other requirements, the student needs to:

1) Pass all the allocated courses from year one to year four,

2) Undergo a mandatory six (6) months comprehensive Industrial Training (IT) with a reputable and specialized industrial organization in or outside the Federal Republic of Nigeria relevant to their major and to their area of interest within the major. A report to this effect will be prepared and presented before the lecturers in the department.

3) Prepare and submit a document (seminar report) of a maximum of 50 pages on a researched Seminar topic of interest and relevant to Biochemistry; and present it (power point) at a Seminar session organized for the purpose.

4) Submit and defend a dissertation (project) following research on a topic. The dissertation should be a maximum of 100 pages, including preliminary pages, and appendices.

7.2 INDUSTRIAL TRAINING

The student Industrial Training is known as Student Industrial Work Experience Scheme (SIWES) and was instituted by the National Universities Commission (NUC). The purpose of this training is to enhance the students' practical experience, promote their career opportunities, and deepen their technical knowledge through practical experience in real-life industrial enterprises. In addition, such training strengthens the relationship between the Department of Biochemistry of Madonna University and the governmental and private industrial firms. Also, it provides the business and industry with well-trained and better prepared professionals.

On their part, students (trainees) are expected to spend a significant portion of the training period in the following areas that may vary depending on the activities of the training organization and the student's field of study:

a. Orientation period covering the organization, its activities, operations etc.

b. Safety regulations and procedures.

c. On-the-job practical training in a related field of engineering.

Furthermore, the student is expected to spend his entire Second Semester of his/her Third Year (300 level) training period with the training organization abiding by its

regulations like any other employee. In addition, by the end of the training period, the student is required to defend and submit a final formal written Industrial Training Report in accordance with Section 7.5 of this document.
In order to assess the actual performance of students during the training period, the training organization shall fill in a confidential and sealed Industrial Training Evaluation Form to be forwarded by the trainee to the Departmental SIWES coordinator with information that include the number of days spent on training, the number of absences, and an overall evaluation of trainee performance.

7.2.1 Students Industrial Work Experience Scheme (SIWES)

The Student Industrial Work Experience Scheme (SIWES) refers to a program which aims to provide supervised practical training within a specified time frame. This training can be carried out either in government organisations or in the private sector. The Student Industrial Work Experience Scheme (SIWES) was established by the Industrial Training Fund (ITF) in 1973 and is the accepted skills training programme, which forms part of the approved Minimum Academic Standards in various degree programmes in Nigerian universities. It is an effort to bridge the gap existing between theory and practice of engineering and technology, sciences, agriculture, medical, management and other professional educational programmes in Nigerian tertiary institutions. Thus, the industrial training is a compulsory course (BCH 382, for Biochemistry students at Madonna) for all students as part of the fulfillment in Bachelor of Science (B.Sc.) Degree in Biochemistry.

SIWES is operated by the ITF with the following stakeholder:

- ***a.*** Federal Government (Federal Ministry of Commerce and Industry)
- ***b.*** Industrial Training Fund (SIWES Division)
- ***c.*** Supervising/Regulatory Agencies (NUC, NBTE, NCCE)
- ***d.*** Industry/Employers (NECA, NACCIMA, MAN, Government Establishments)
- ***e.*** Tertiary Institutions (Universities, Polytechnics, Colleges of Education) and
- ***f.*** Student Trainees (Engineering, Science, Technology, NCE Technical)

It is funded by the Federal Government of Nigeria. Its beneficiaries are undergraduate students of the following: Agriculture, Engineering, Technology, Environmental Science, Education, Medical Science and Pure and Applied Sciences. The duration of the training is four months for Polytechnics and Colleges of Education, and six months for the Universities.

7.2.2 Industrial Training Aims and Objectives

The main aim of the Industrial Training program is to produce graduates who are ready to face the working world. The program also aims to produce the knowledgeable, skilled and experienced graduates, demanded by employers, who are

able to apply the knowledge acquired at university to the working world. The Industrial Training program provides opportunities for exposure to the working world, which will make graduates more aware of the hopes and expectations that industry has of them. The program will also equip students with real work experience. Placing students in industry also increases their chances of employment after graduation, as there is a strong possibility that they will be offered a job in the same place where they do their training. Apart from this, the training experience will further solidify the on-campus learning process and activities, while also providing students with relevant work experience.

The overall objective of Industrial Training is to expose students to the work environment in their fields of biochemistry. In particular, Industrial Training the following main objectives:

d. To expose students to the industrial environments and skills in their course of study, which cannot be simulated in the classroom.
e. To apply the knowledge acquired in classrooms in real industrial situations.
f. To use the experience gained from the Industrial Training' in discussions held in the lecture rooms.
g. To gain experience in writing reports in biochemical works/projects.
h. Prepare students for the work situation they are likely to meet after graduation.
i. To expose students to the industrial responsibilities and ethics.
j. Provide students with opportunities to earn some income.
k. To expose the students to future employers by making the transition from the university to the world of work easier, and thus enhance students contacts for later job placement.
l. Familiarize with various materials, processes, products and their applications along with relevant aspects of quality control and shop floor management.
m. Expose students to work methods and techniques in handling equipment and machinery that may not be available in the Universities.
n. Understand the psychology of the workers and their habits, attitudes and approach to problem solving.
o. Get exposed to the current technological developments relevant to the subject area to which the training pertains.
p. Understand the social, economic and administrative considerations that influence the working environment of industrial organizations.
q. Give the training organizations an idea about the quality of future human resources. This will strengthen the employer's involvement in the entire education process of preparing university graduates for employment in industry.
r. Enhance the relationship between the Universities and public and private sectors.
s. Test the students' career interests.

With the above mentioned exposure, students are expected to improve in the following aspects which are important such as:

a. Critical analysis
b. Produce good report writing
c. Presentation skills
d. Argue logically
e. Interaction with other professionals
f. Human skills and community expectation
g. Awareness of contemporary issues

The training should not necessarily focus on the technical aspect only such as design and analysis/calculation in any specific area of specialization. The focus should also include on the development of ability, competency and interpersonal skills as a professional biochemist as a whole.

At the end of the training, students are expected to be able to:

a. Describe the work they have been doing during the training
b. Explain the experience they have gained during the training
c. Apply theoretical knowledge and practical skill in solving biochemical problems
d. Communicate effectively with all level of staffs in the organization

7.2.3 Duration of the Industrial Training

Third Year (300 Level) biochemistry students should spend at least Six (6) months on a full-time basis in a governmental organization, a reputable industrial firm, or a research center that conducts and/or is involved in biological activities.

7.2.4 Industrial Training Reports

Students should prepare two (2) reports namely:
(a) Daily Training Diary; this is a weekly report which is to be completed in the Industrial Training Log Book. (b) Industrial Training Report; two copies of industrial training report are required; one for students themselves and one for the Department. The report must be based on the industrial training report guide as provided in Section 7.5.

7.2.4.1 Daily Training Diary

The main purpose of writing daily training diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students own thought process and reasoning abilities. The students should record in the daily training diary (Log Book) the day to day account of the observations, impressions and information gathered. It should contain the sketches and drawings

related to the observations made by the students. Drawings, sketches, specification of equipment, used, should be given wherever essential.

The daily training diary should be signed after every two weeks by the officer-in-charge of the section in which the student has been working. The diary should also be produced to the supervisor visiting the industry from time to time and ratified on the day of his visit. The daily training diary will be evaluated on the basis of the following criteria:

- ***a.*** Regularity in maintenance of the diary.
- ***b.*** Adequacy and quality of information recorded.
- ***c.*** Drawings, sketches and data recorded.
- ***d.*** Thought process and recording techniques used.

7.2.4.2 Industrial Training Report

A student should learn about equipment, machines, processes and other industrial practices in industry. After collecting the information, he should prepare a comprehensive training report after completion of his/her training period to indicate what he/she has observed and learnt in the training period. The last week of the training should be utilized for the purposes of writing this report, originality and method of presentation is very important for writing training report. The daily training diary will help to a great extent in writing the industrial report since much of the information has already been incorporated by the student into the daily training diary. The training report will be evaluated on the basis of following criteria.

- ***a.*** Originality
- ***b.*** Very adequate and purposeful write-up.
- ***c.*** Organization, drawings, sketches, format, style, language etc.
- ***d.*** Variety and relevance of learning experience.
- ***e.*** Practical applications and their co-relation with basic theory and concepts taught in the course.

The daily training diary and Industrial Training Report should be submitted by the students to the Department immediately as per notice after the completion of the training. The submitted report should be duly verified and signed by the relevant authorities listed on the certification page.

7.2.5 Evaluation

The industrial training of the students will be evaluated in two stages; evaluation by Industry and evaluation through seminar presentation/*viva-voce* at the Department.

7.2.5.1 Evaluation by Industry

The industry (officer-in-charge) would be evaluating student's learning progress based on the Punctuality, Maintenance of Daily Diary and skill test throughout the training period. This evaluation is presumed to be captured by the comments of the industry-based supervisor in the log book. All observations are made towards the aim of students' achieving the learning objectives.

7.2.5.2 Evaluation through Seminar Presentation

The students will present his Industrial Training report though seminar, which will be held by a committee constituted of departmental lecturers. The evaluation through seminar presentation will be based on the following criteria:

- ***a.*** Dressing: Simplicity and neatness
- ***b.*** Comportment of the presenter
- ***c.*** Communication: correction of grammar, fluency and simplicity
- ***d.*** Quality of material presented.
- ***e.*** Proper planning for presentation.
- ***f.*** Effectiveness of presentation and boldness to address the audience.
- ***g.*** Depth of knowledge and skills.
- ***h.*** Attendance record, daily diary report shall also be analyzed along with the Training Report.

Seminar presentation will have advantage of sharing knowledge and experience amongst students and teachers and building communication skills and confidence in students.

Grading of these evaluations would be as follows:

Section	***Grade***
Log Book	30 marks
Training Report	30 marks
Oral Presentation	40 marks
Total	***100 marks***

Based on the above evaluation, results of the industrial training (BCH 390) would be presented to students as: **0 –44 = F, 45 – 49 = D, 50 – 59 = C, 60 – 69 = B and 70 – 100 = A.**

Students are advised to focus on the report writing. The written report should be of professional quality and explains the learning experience achieved by the student. The training report should not be considered as a collection of forms, noted pictures with paged numbers and later compiled together. If the report is not of minimum standard, students would be asked to rewrite the report. It is reminded that industrial training is part of the requirements for a degree in the Bachelor of Science (Biochemistry). Students are thus advised to take this training program seriously.

7.2.6. Contents of Industrial Training Report

7.2.6.1 Body of Industrial Training Report

An Industrial Training Report must be divided into chapters. A title must be given to each chapter which reflects its content. A new chapter must begin on a new page. A chapter may be further divided into several sections and sub-sections depending on type and volume of work. The various divisions should have appropriate titles numbered accordingly.

The body of the Industrial Training Report must be written in paragraphs. Each paragraph describes an issue or a subject. There must be continuity or logical flow between paragraphs. Long paragraphs should be avoided. Training report should consist of following chapters:

- **a.** Chapter 1: Introduction
- **b.** Chapter 2: Brief History of the Organization
- **c.** Chapter 3: Equipment utilized during the training
- **d.** Chapter 4: Projects done, Skills and Knowledge Acquired
- **e.** Chapter 5: Conclusion and Recommendations

Each chapter should be given an appropriate title. Tables and figures in a chapter should be placed in the immediate vicinity of the reference where they are cited. The chapters must be written as described in section 7.4.

Chapter 1-Introduction

The introduction is, in principle, a more detailed abstract and an introduction to the topic in general. Here is the opportunity to motivate the topic more precisely, define the environment, discuss the problem, previous work, and to give an overview of the paper.

This chapter therefore describes the training in general, highlighting the following:

a. History and objectives of the industrial training program

b. The scope of the industrial training program
c. Duration
d. Introduction of the organisation or company background
e. The importance of the industrial training program
f. Benefits derived from the training
g. Objectives of the report/write-up

Chapter 2- Company and Organisational Background

A brief introduction to company structure is recommended as follows:

a. Organizational history
b. Organizational structure and hierarchy
c. Board of directors and management team
d. Vision and mission
e. Functions performed by the department(s) in the industrial training organization
f. Other important details

Chapter 3-Equipments utilized during the training Program

Describe the instrumentation, principles, usage and functioning of all the biological devices, equipment and appliances used in executing and fulfilling directed tasks.

Chapter 4- Projects done: Skills and Knowledge Acquired

This chapter must constitute the major part of the report. It will cover the detailed explanation of methodology that is being used to make your project/ task/ assignment complete and working well, theoretical and practical knowledge from biochemistry used for the task given and problems faced during task execution, general skills and implementation management of task. Other aspects include:

a. Knowledge gained from the work experience: Describe what you exactly did there and what experiences you have gained throughout your training.
b. Contribution of the project to the company: Something that you do or give to help produce or achieve something together with other people during the industrial training period.
c. How has the industrial training expanded / broadened your knowledge? A comparison between theory (things that you have learned in the classroom) and practice (things you did or observed at the company) must be made.

Chapter 5-Conclusion and Recommendations

This chapter summarizes personal impressions about the training, the working experience identifying the student's strength and weaknesses during training, and

describes how the industrial attachment has helped his/her personal growth, development, and preparation or expectation for future professional work. Suggestions for future improvements are necessary.

References

Only reference read by the writer can be cited. The details of every references cited in the text, published or unpublished, must be listed alphabetically (see Attachment I). Reference page must be written according to the styles as described in Section 7.6

Appendices

Appendices are provided to give supplementary information, which is included in the main text may serve as a distraction and cloud the central theme.

- **a.** Appendices should be titled and numbered alphabetically, e.g. Appendix A, Appendix B and so on.
- **b.** Appendices, Tables and References appearing in appendices should be numbered and referred to at appropriate places just as in the case of chapters.
- **c.** Appendices shall carry the title of the work reported and the same title shall be made in the contents page also.

7.3 SEMINARS AND PROJECTS

In order to prepare and present seminar and also undertake a project research, the student is usually given a Supervisor, who is invariably, a member of staff of the Department. There are usually some members of the Department appointed by the Head of Department (HOD) to follow up the general progress of these activities according to a pre-established calendar. Further, students make maximum use of the opportunities provided by the Seminars and project to enhance their understanding of Biochemistry.

7.4 CONDITION FOR SUBMITTING INDUSTRIAL TRAINING REPORT, SEMINAR REPORT AND DISSERTATION:

1) **Number of copies**: 03 for IT Report, 03 for seminar report and 04 for dissertation/thesis.

   One copy of the IT report is for the student, the second for the department and the third for the SIWES office. One copy of the Seminar report if the seminar presentation is successful shall become the property of the University and shall be deposited in the Departmental library. Two copies of the project if successful

shall also become a property of the University and shall be deposited in the University library and in the Departmental Library respectively. The other copies of both seminar report and dissertation shall be retained by the student and his/her supervisor(s) respectively. Reports intended for submission to the department must be produced according to the prescribed format described. Any reports that do not conform to the format will be out rightly rejected.

2) **Language** The report should be written in British (UK) English.

3) **Paper quality**: Documents are presented in a permanent and legible form in type-script or print. Typing should be of even quality (Time New Romans font size 13) with clear black characters. A4 size plain white paper (210 x 297 mm) must be used. It should be of good quality and sufficient opacity for normal reading. Printing should be only on one side of the paper.

4) **Page Margin**: The margins at the binding edge (left) must not be less than 1.25 inches, 0.75 inch on right side and top and bottom 1.0 inch respectively. Double lines spacing should be used in type-script throughout and alignment should be justified.

5) **Pagination**: All pages must be numbered in one continuous sequence (format: central bottom). The preliminary pages from the "Cover page" to the "List of Abbreviation" in lower case Roman numerals (from i onward). Thereafter, from the Introduction to the last typed page including attachment (appendix) in Arabic numerals (from 1 onwards). This sequence must include everything bound in the volume.

6) **Binding**: IT and Seminar reports are normally submitted in a soft bind form, while the dissertation is bound in standardized form as follow: navy blue art vellum overcast; edges uncut; lettered boldly on the spine in gold DEGREE, DATE, NAME.

7) **Preliminaries**:
   a) **Cover page:**
      i) For IT report, the cover page (front cover) must contain information (all in capital letters) listed in the following order:-
      a. Student Industrial Work Experience Scheme (SIWES) Training Report, Course Code in bracket

b. Name and address of Company and duration of Training period
c. Student's full name and Reg. No.
d. Department's/Faculty/University
e. Month and Year of report submission
(Attachment A shows the layout of this page).

ii) For Seminar and project reports, the cover page bears the Title of the seminar or dissertation (project), the name of the Student and Registration number, "Department of Biochemistry, Faculty of Science, Madonna University, Nigeria", Month and Year of submission. *(Attachment B and C show the layout of this page for Seminar and Project respectively).*

b) Title page: This bears all the information listed in a) above and the following caption: "a research project (or Seminar report) submitted in partial fulfillment of the requirements for the award of Bachelor of Science (B.Sc.) Degree in Biochemistry" "Department of Biochemistry, Faculty of Science, Madonna University, Nigeria", Name of Supervisor, Month and Year. *(Attachment D, E and F show the layout of this page).*

c) Declaration: Students are to declare that the information contained in IT Seminar or Project reports are correct an original. This page must be signed by the student.

d) Certification: The relevant authorities are to certify that the report has been written appropriately and according to the required specifications. For IT report, the certificate should carry the signature of the Departmental IT supervisor, SIWES coordinator and the HOD. For Seminar and Project, it should carry the signature of the student's supervisor, the Departmental Seminar or Project coordinator and the HOD. This would be followed by their names. The certification page is to follow the format and contents as shown in Attachments G and H.

e) Dedication: This part is optional. The student may decide to offer the report to somebody as a sign of thanks or respect.

f) Acknowledgements: The student may acknowledge the assistance of various individuals or organizations during his/her training. The length of the acknowledgement should not exceed one page.

g) Abstract: It should be brief, written in one paragraph, not more than 250 words. If it is IT Report, the abstract description should include the organization and department with which the student was attached to, the assigned tasks/projects/duties/responsibilities, the achievements and results, and the learning experience gained during the training period. If it is a Seminar report, it should present a brief summary of the topic. On the day of the Seminar, the abstract (also called Summary) should be extracted with the references for distribution to the panel of Faculty. If it is a Dissertation, it should present a brief introduction and the reasons for the study, an outline of the methods used, the main findings (specific data), and the main conclusions.

h) Table of Contents: This page is self-explanatory. This page should list all sections, chapters, headings and sub-headings with their respective page numbers as reflected in the body of the report. The table of contents needs to be a good guide. Refer to sample in Attachment I

i) List of Figures: This should include the full list of all illustrative material found in the report. The list of figures should use exactly the same captions as they appear below the figures in the text. Refer to sample in Attachment J

j) List of Tables: All tables shown in the thesis shall be listed here excluding tables in attachments or appendix. The list of tables should use exactly the same captions as they appear above the tables in the text. Refer to sample in Attachment J.

k) List of Plates: Photographic materials of all kind taken during the cause of the research should be listed here.

l) List of Abbreviations and Symbols (If any): The list of symbols, abbreviation and nomenclature should be listed with their full meaning. Standard symbols, abbreviation etc. should be used. (DO NOT list standard international abbreviations). They should be listed in alphabetical order. The order should be first Greek letter, followed by

Latin, Upper case English alphabets followed by Lower case English alphabets. Refer to sample in Attachment K.

m) Typing character: "Times New Roman" should be used throughout the work.

n) Font size: up to 18 is acceptable for titles; 13 for the body of the text.

o) Main body of text: Should be double-spaced.

p) Illustrations, etc.: Photographic and other material must be permanently mounted on A4 paper and bound in with the document. In no circumstances should "cello tape" or other material be used for such purposes.

q) Corrigenda: Students are reminded that they are responsible for any errors in the text they present. Every effort should be made to correct all errors before submission.

7.5 FORMAT OF INDUSTRIAL TRAINING REPORT, SEMINARS AND PROJECTS

7.5.1 Title / Paragraph Margin

a) Chapter number and title should be centered.
b) Subsection number should align with the left margin.
c) Subsection title should be indented (1.5 cm) from the left margin.
d) The first paragraph in a subsection should align with left margin.
e) The subsequence paragraphs should be in blocks no indentations. Make sure your paragraphs are not too short or long. Do not make one-line paragraphs. Refer to some text books or journal papers if you are not sure.
f) General alignment for texts in paragraph should be "justified".

7.5.2 Chapter Title

They must be written in Uppercase, Bold, Centered while the Chapter Sub-section in Title Case, Bold, Align left

Note:

a) A new chapter must start on a new page, a subsection title should not begin on the last line of a page and a new paragraph should not begin on the last line of a page.
b) Always add a space after a full stop, comma, colon, etc. Also, leave a space before opening a bracket. If the sentence ends with a closing bracket, add the full stop (or comma or semicolon, etc) after the bracket.
c) Do not add a space before a full stop, comma, colon, etc.
d) Using a hyphen can be tricky. If two (or more) words form a single adjective, a hyphen is required; otherwise, it should not be used. For example, (i) A short-channel device shows a finite output conductance. (ii) This is a good example of mixed-signal simulation. (iii) Several devices with short channels were studied.
e) Do not use “&"; write “and" instead. Do not write “There're" for “There are" etc.
f) If you are using Latex, do not use the quotation marks to open. If you do that, you get "this". Use the single opening quotes (twice) to get “this".
g) Do not use very informal language. Instead of “This theory should be taken with a pinch of salt," you might say, “This theory is not convincing," or “It needs more work to show that this theory applies in all cases."
h) Do not use “bullets" in your report. They are acceptable in a presentation, but not in a formal report. You may use numerals or letters instead.
i) Whenever in doubt, look up a text book or a journal paper to verify whether your grammar and punctuation are correct.
j) Do a spell check before you print out your document. It always helps.

7.5.3 Numbering the Chapters and Subsections

All chapters and their subsections must be numbered and titled.

Example: CHAPTER Two: Title of Chapter
2.1 Title of the subsection (second level)
2.1.1 Title of the sub-subsection (third level)
2.1.1.1 Title of the sub-sub-subsection (fourth level)

Note: It is not recommended to have subsection more than level four.

7.5.4 Equations in Text (if applicable)

a) All equations must be numbered (in brackets) with respect to the chapter using Arabic numeric. For example, (4.3) is the third equation that appears in Chapter 4.
b) Equation should be centered, but its numbering should align with right margin.
c) One spacing before and after mathematics operators (=, +, - etc.).
d) Equation should be followed by explanations of the symbols together with their units, if the symbol appears for the first time in the text. Example:

$$F = ma \quad (4.3)$$

where F is force (N), m is mass (kg) and a is acceleration (m/s^2)

7.5.5 Tables in Text

At important positions, it is essential to use images, illustrations, other graphical representations and tables to make the written statements more clear. These should always have a detailed caption which should also be understandable without reading the text. Every figure and table should be referenced from the text and should appear as close to the reference as possible. It is forbidden to include a figure or a table without explaining it in the text.

To construct a table, consider the following:

a) All tables must be numbered with respect to the chapter using Arabic numeric. For example, Table 4.3 is the third table that appears in Chapter 4.
b) All tables must have a caption, which should be positioned at the top of the table. Caption should be bold and written in Title Case.
c) If the caption is written in a single line, it should be justified. If the caption is more than one line, it should be align to the left and in single spacing.
d) A table should be positioned after it has been cited for the first time in the text and should be placed in the immediate vicinity of the reference where it is cited. All tables in the chapter can also be grouped together and positioned at an appropriate location.
e) Tables which are presented in landscape format should be bound with the top of the table to the spine.
f) Tables should be properly set up with a straight edge. Horizontal lines must be included but it not necessary to always include vertical lines i.e. tables should be drawn with no vertical lines and a maximum of three horizontal lines. This can be achieved by grouping related column headings under larger headings.
g) Column or Row headings should be complete and self-explanatory. A heading is a separate entity from the title. It cannot be assumed information given in the title is adequate for a heading. The unit of measurement should only be included in the heading, not in column data.
h) If abbreviations are used in table, indicate what abbreviations mean as a footnote. Other footnotes may be required to clarify material in the table.
i) Sometimes it is necessary to copy tables from other sources, but in general you should draw tables by yourself, not copy them from other sources! If you copy tables from somewhere else, you have to make clear from which source they are taken. The source of a table must be cited in bracket at the bottom of the table. For example (source: Lukong *et al.*, 2014). Always cite the

reference of tables right there, even if you have cited it earlier.

7.5.6 Figures in Text

The following are important points to keep in mind when preparing your figures (graphs, diagrams, photographs, films):

a) All figures must be numbered with respect to the chapter using Arabic numeric. For example, Figure 4.3 is the third figure that appears in Chapter 4.
b) All figures must have a caption, which should be positioned at the bottom of the figure. Caption should be bold and written in Title Case.
c) If the caption is written in a single line, it should be justified. If the caption is more than one line, it should be align to the left.
d) Figure should be positioned after it has been cited for the first time in the text and should be placed in the immediate vicinity of the reference where it is cited. All figures in the chapter can also be grouped together and positioned at an appropriate location.
e) Axes in figures must carry appropriate units. If that is not done, at least the caption must say, "concentration is in mM," etc.
f) Figures which are presented in landscape format should be bound with the top of the figure to the spine.
g) Sometimes it is necessary to copy figures from other sources, but in general you should draw figures by yourself, not copy them from other sources! If you copy figures from somewhere else, you have to make clear from which source they are taken. The source of a figure must be cited in bracket after the title. For example; Table 2.1: Title (Moundipa *et al*., 2014). Always cite the reference of figures right there, even if you have cited it earlier.

7.5.7 Abbreviations in text

Use abbreviations sparingly. If you have to abbreviate, try to find a standard abbreviation given in Ulrich, Abacus or CABI abstracting agencies rather than making up one specific to your report. Some commonly used abbreviations and acronyms (an acronym is an initialism or abbreviation that can be pronounced as a word) have become words in themselves; DNA and ELISA, for example, are rarely spelled out. Avoid using abbreviations at the beginning of sentences and in titles. Never begin a sentence with a single-letter abbreviation (I instead of iodine, for instance). Let the context decide whether to use an abbreviation.

Abbreviations could be used in the text provided it is written in full where it appears first time in text. The following are exceptions to this rule:

b) Titles: Such as Mr., Mrs., Ms., M/S, Sr., Jr. etc. are always abbreviated.
c) Lengthy Words: Acceptable abbreviations for lengthy words and phrases are used separately throughout the text. Such abbreviations must be presented in

parentheses immediately after the words or phrase for which they stand. For example "Phosphate buffered saline (PBS) was used in all dialysis operations". In succeeding sentences throughout the thesis, initials PBS could be used in place of words phosphate buffered saline.

d) Commonly Used Abbreviations: Abbreviations such as "mm" and "cm" which do not require a period, or an "s" to make a plural, are acceptable. The very form must agree with the quantity, e.g. "one mm is…., but Three mm are …"
e) Space and Time: To save space and time, it is sometimes convenient to use abbreviations for lengthy words or phrases used separately throughout the text. Abbreviations must be presented in parenthesis immediately after the words or phrases for which they stand.

7.5.7 Writing Styles for Date, Numbers and Units

The format for writing units, symbols, numbers etc. in the I.T. Seminar and Project Report follows the International System of Units (SI). The following sections give some common descriptions of the writing styles. The use of the correct symbols and names for SI units, and for units in general are mandatory. In this way ambiguities and misunderstandings in the values of quantities can be avoided.

Date The international standard (ISO 8601) date notation is YYYY-MM-DD where Y is the year, M is the month and D is the day. The following date formats are also acceptable (no hyphen):

a) August 31, 2008 (with comma after the day)
b) 31 August 2008 (without any comma)
c) The 31st of August, 2008 (note the comma, "the" and "of")

Duration in years is written as 1820-1905 or 1983-85.

Numbers When writing numbers:

a) Avoid starting a sentence with a number or symbol.
b) Number has to be used together with unit; if not it has to be spelled out (e.g. three cats; *not* 3 cats).
c) If the number is between +1 and -1, the decimal marker is always preceded by a zero (e.g. 0.15; *not* .15).
d) Numbers with many digits may be divided into groups of three by a thin space, in order to facilitate reading. Neither dots nor commas are inserted in the spaces between the groups (e.g. 43 765 589, 58.159 25; *not* 43,765,589; *not* 58.159,25).
e) When there are only four digits before or after the decimal marker, it is customary not to use a space to isolate a single digit (e.g. 5879, 1.5681)

f) When multiplying numbers, use only the multiplication sign "×" with a space before and after, *not* centre dot (·) nor the letter "x" or "X" (e.g. 25 × 5.3; *not* 25 · 5.3; *not* 25 x 5.3).

Units

If possible, use SI units; although other commonly used non-SI units are also acceptable (e.g. ℃ for temperature, bar for pressure). Spacing for the units:

a) Always leave a space between the number and the unit (e.g. 5 cm, 50 °C, 30 %; not 5cm; not 50°C; not 30%).
b) Exception for angular degree (°), minute (′) and second (″) (e.g. 3°, 45′) which are placed immediately after the number.

Concerning symbols for Units:

a) Use symbol for units and not their abbreviation (e.g. 5 s; *not* 5 sec.).
b) Symbols for units are written in upright type i.e. not italic (e.g. m for metres, g for grams). This is to differentiate them from italic type symbols used for variables (e.g. *m* for mass).
c) Symbols for units are written in lowercase, except for symbols derived from the name of a person, which starts with uppercase. However, the *unit name* itself is written in lowercase. (e.g. the unit for pressure is named after Blaise Pascal; the unit itself is written as "pascal" whereas the symbol is "Pa"; 5 Pa or 5 pascal; 5 J or 5 joule; 5 N or 5 newton)
d) Symbols are not pluralised (e.g. 5 kg; *not* 5 kgs).
e) Symbols do not have an appended period / full stop (.) unless at the end of a sentence.
f) Symbols derived from multiple units by multiplication are joined with a space or centre dot (·) (e.g. N m for N·m). Hyphens (-) should not be used (e.g. *not* N-m). [*Note: centre dot* (·) *is different from period / full stop* (.)*; centre dot is available under command Insert Symbol*].
g) Symbols formed by division of two units are joined with a solidus (/) (slash (/) is also acceptable) or given as a negative exponent (e.g. m/s or m s^{-1}).
h) Only one solidus should be used (e.g. kg·m^{-1}·s^{-2} or kg/(m·s^2); *not* kg/m/s^2).
i) Do not mix unit symbols and unit names within one expression (e.g. coulomb per kilogram; *not* coulomb per kg).

Concerning SI Prefixes:

a) Prefix symbols are attached to unit symbols without a space or hyphen (-) between the prefix symbol and the unit symbol (e.g. km; *not* k m; *not* k-m).
b) The same also apply for prefix names (e.g. kilometre; *not* kilo metre; *not* kilo-metre)
c) Prefix symbols are written in upright type, i.e. not italic. (e.g. kPa; *not k*Pa).

d) All prefix *symbols* larger than kilo (10^3) are uppercase; the rest are lowercase (e.g. MW, GHz, kW, mg, nm).
e) All prefix *names* are lowercase, except at the beginning of a sentence (e.g. megawatt, gigahertz, kilowatt, milligram, nanometre).
f) A prefix is never used in isolation; and compound prefixes are never used (e.g. 10^{-9} m is nm or nanometre; *not* mμm or millimicrometre).
g) Finally, read over your typed document carefully. You lose a lot of marks by allowing typographical errors (and attributing them to the typist). Hand-written corrections in the report should, be avoided.

7.6 REFERENCES/BIBLIOGRAPHY:

7.6.1 What is Referencing?

Referencing is a method used to acknowledge or identify the sources where you have obtained information and ideas that you used to write your IT, Seminar or Project reports. So while you write the text of your work, always use references to acknowledge the sources of your information. This means that whenever you present a statement of evidence such as a quote, or when you use someone else's ideas, opinions or theories in your own words (paraphrasing), you must indicate the source of the opinion, idea or theory. The full references cited in the text are then listed at the end of your report in the References list. Sources could include Books, Journals, Conference Documents, Websites, etc. These sources have specific ways of presenting them in the Reference List.

There are many methods for writing Bibliography (References), but the Department of Biochemistry Madonna University, Nigeria has chosen the **American Psychological Association (APA)** method. This method provides a standardized format that ensures those references are accurate, complete and useful to the reader. APA requires two elements: an in-text citation and a reference list.

APA's style rules and guidelines are set out in a book called Publication Manual of the American Psychological Association, 6th Edition (2012) which is available from EIT libraries (http://www.psychwww.com/resource/APA Research Style Crib Sheet.htm)

7.6.2 Why is Referencing Important?

Referencing is necessary to avoid plagiarism, verify quotations, enable readers to follow-up and retrieve the cited source. If you quote or paraphrase someone else's work or ideas, you must acknowledge the author and source. If you don't, you may be accused of ***plagiarism***.

7.6.3 Steps Involved in Referencing

a) In preparation for referencing, note down the full bibliographic details, including the page number(s) from which the information is taken.

b) Insert the citation at the appropriate place within the text of the document. This is called an in-text citation (see examples below).

c) Provide a reference list at the end of the document (see examples below).

7.6.4 In-Text Citation

Document your study throughout the text by citing the author (or brief title if there is no author) and year of the works you researched. The reader can then locate the complete source in the alphabetical reference list at the end of your work. The in-text citation is highlighted in this example:

> Using technology to catch cheats is a common response to the problem of student plagiarism **(Townley and Parsell, 2004)**.

7.6.5 Reference List

A reference list only includes the sources that are cited in the text. A list which consists of relevant sources that are not cited in the text is called a bibliography. The reference list is arranged alphabetically by surname of the first author. For example:

> Townley, C., & Parsell, M. (2004). Technology and academic virtue: Student plagiarism through the looking glass. *Ethics and Information Technology*, 6(4), 271-277. Retrieved from ABI/INFORM Global database.

7.6.6 Electronic Information

For all electronic information, in addition to the above, also note (1) the date that you accessed the information if it is content that is likely to change or be updated (2) its location - the web address (URL), Digital Object Identifier (DOI) or database name

A Digital Object Identifier (DOI) is a unique alphanumeric string used to identify content, usually journal articles, and provides a persistent link to its location on the Internet. When a DOI is available, include the DOI instead of the URL or database name in the reference.

7.6.7 Final Check

When you have completed your reference list, check that: a) each entry appears in the text and the reference list, b) the text citation and reference list entry match exactly in spelling and year.

A. BOOKS

Bibliographic elements that may be required to create a reference for a book are as follows:

Author or authors
Year of publication
Title of publication
Title of series
Description of the work
Chapter title
Edition
Editor, compiler, reviser, translator, or illustrator
Volume number or number of volumes
Place of publication (city and country, or city and state (abbreviated) if place of publication is in the USA – see Appendix)
Publisher
Page numbers

Commas, full stops and colons are used to separate the elements. Some elements also require parentheses. Invert all authors' names so that the surname or last name is written first. The authors' first names are abbreviated so that **Francis Mbuh Awah** would become **Awah, F.M.** After the author name, the year of publication is added in parentheses followed by the title of the book (in italics, with proper nouns and the first word of the title and subtitle capitalised). The edition is next and the place of publication and the publisher are added last. Like this template:
Author, A. (Year). *Title* (edition.). Location: Publisher.

Example: Bibliographic elements required:
Title: Lehninger Principles of Biochemistry
Authors: David L. Nelson and Michael M. Cox
Published 2008, 5th edition
Published by Sara Tenney in New York
Each bibliographic element is positioned in the reference like this:

Nelson, D.L., & Cox, M. M. (2008). *Lehninger Principles of Biochemistry* (5th ed.). New York, USA: Tenney. pp200-210.

Book Examples	***In-Text Example***	***Reference List Example***
One author	Bernstein (1965) claimed that … OR The theory was first put forward in 1960 (Bernstein, 1965).	Bernstein, T. M. (1965). *The careful writer: A modern guide to English usage*. New York, NY: Atheneum. Pp 4-10.
Two authors	**Always cite both authors. Note the different use of "and".** Strunk and White (1979) found … OR The majority found … (Strunk and White, 1979).	Strunk, W., and White, E. B. (1979). *The elements of style* (3rd ed.). New York, NY: Macmillan. Pp 20-30.
Multiple authors for 3-5 authors	**Cite all authors the first time.** Morreale, Spitzberg, and Barge (2007) … **In subsequent citations include only the surname of the first author followed by "*et al.,*" and the year. ("*et al*" means and others and always in italic with a full stop after "al").** Morreale *et al.* (2007) …	Morreale, S. P., Spitzberg, B. H., & Barge, J. K. (2007). *Human communication: Motivation, knowledge and skills* (2nd ed.). Belmont, CA: Thomson Wadsworth. Pp 40-47.
Multiple authors for 6 or more authors	**With six or more authors, cite only the surname of the first author, followed by "*et al.*"** Awah *et al*. (2013) found … OR … (Awah *et al*., 2013). Gloster *et al*. (2010) suggest … OR … (Gloster *et al*., 2010).	**When a reference has up to seven authors, spell out all the authors' names in the reference list.** Awah, F. M., Abouo, A. M., Ayiam I., Kemajou, S., Lukong C. B., & Mounmbegna E. P. (2013). *Understanding Basic Immunology and Immunochemisyry.* (1st ed.). Benin City, Nigeria: Lema Printing and Publishing Co. Pp 40-70 **When a reference has more than seven authors spell out the first six and the final author's name separating them with an ellipse.** Gloster, J., Jones, A., Redington, A., Burgin, L., Sorensen, J. H., Turner, R., … Paton, D. (2010). *A handbook of critical approaches to education*. New York, NY: Oxford University Press. Pp 102-109

Corporate author and corporate author as publisher	**If these are long, they may be spelled out in the first citation and abbreviated thereafter.** **First text citation:** (American Psychological Association [APA], 2009) **Subsequent text citations:** (APA, 2009)	American Psychological Association. (2009). *Publication manual of the American Psychological Association* (6th ed.). Washington, DC: Author. **The word *Author* in the place of publisher indicates the author also published the document.**
Multiple works (when two or more references are cited to make the same point)	**List two or more works by different authors who are cited within the same parentheses in alphabetical order by the first author's surname. Separate the citations with semicolons.** (Grace, 2009; Haynes, Butcher, and Boese, 2004; National Animal Welfare Advisory Council, 2007)	**Order alphabetically in the reference list.** Grace, P. J. (2009). *Nursing ethics and professional responsibility in advanced practice*. Boston, MA: Jones and Bartlett. Pp 11-20 Haynes, L. C., Butcher, H. K., & Boese, T. A. (2004). *Nursing in contemporary society: Issues, trends, and transition to practice*. Upper Saddle River, NJ: Pearson Prentice Hall. Pp 14-19 National Animal Welfare Advisory Council. (2007). *Companion cats: Animal welfare (companion cats) code of welfare 2007: A code of welfare issued under the Animal Welfare Act 1999*. Wellington, New Zealand: Author.
Multiple works by the same author	**Arrange two or more works by the same author by year of publication. Give author's surname once; for each subsequent work, give only the date.** University research has indicated that… (Brown, 1982, 1988).	**Order chronologically in the reference list.** Brown, P. (1982). *Corals in the Capricorn group.* Rockhampton, Australia: Central Queensland University. Pp 29-40 Brown, P. (1998). *The effects of anchor on corals*. Rockhampton, Australia: Central Queensland University. Pp 20-29

Multiple works published in the same year by the same author	**Use a/b etc. to differentiate between works in the same year.** In recent works … (Napier, 1993a, 1993b).	**Order alphabetically by title in the reference list.** Napier, A. (1993a). *Fatal storm.* Sydney, Australia: Allen & Unwin. Pp 14-19 Napier, A. (1993b). *Survival at sea.* Sydney, Australia: Allen & Unwin. Pp 2-10
Edited book	Emerson and McPherson (1997) state … OR (Emerson & McPherson, 1997).	**Ed. or Eds. is given in parentheses following the last editor's name.** Emerson, L., & McPherson, J. (Eds.). (1997). *Writing guidelines for education students.* Palmerston North, New Zealand: Dunmore Press. Pp 130-140
Chapter of an edited book	O'Neill (1990) found that … OR … (O'Neill, 1990).	**Invert the chapter authors' names as noted above, but do not invert the book editors' names.** O'Neill, A. (1990). Gender and education: Structural inequality for women. In J. Codd, D. Harker, & R. Nash (Eds.), *Political issues in New Zealand education* (2nd ed., pp. 74-97). Palmerston North, New Zealand: Dunmore Press. Pp 90-101 **Include the page range of the relevant chapter in parentheses. Where there is an edition number, the page range is included in the same set of parentheses.**
Dictionary or encyclopaedia with large editorial board	(Hanks et al., 1989)	**For major reference works with a large editorial board, you may list the name of the lead editor, followed by "*et al.*".** Hanks, P., *et al.* (Eds.). (1989). *Collins pocket English dictionary.* London, England: Collins. Pp 40
Missing Information		
No author	**Cite the first few words of the reference entry (usually the title) and the year. Use double quotation marks around the title of an article, chapter or web page. Begin each word with a capital letter.**	New drug appears to sharply cut heart risk. (1997, July 21). *The Dominion*, p. 6. **Italicize the title of a periodical, book, brochure or report.** *Merriam-Webster's collegiate dictionary* (11th ed.). (2005). Springfield, MA: Merriam-Webster. Pp 22

	("New Drug," 1997) **Italicise the title of a periodical, book, brochure or report.** (*Merriam-Webster's Collegiate Dictionary*, 2005)	**Place the title in the author position. Alphabetize books with no author or editor by the first significant word in the title (*Merriam* in this case).**
No date	(McApple, n.d.)	McApple, J. (n.d.). An apple a day keeps the doctor away. Retrieved from http://www.applemania.org
No city	(Smith, 2003)	**When no city has been identified in print material, search online and use the city/state for the publisher's head office.** Smith, J. (2003). *Ethics in New Zealand*. Wellington, New Zealand: Huia Publishers.

B. PERIODICAL PRINT INFORMATION

Bibliographic elements that may be required to create a reference for periodical print information are as follows:
Author or authors
Year of publication
Title of publication
Title of series
Description of the work
Article title
Edition
Editor, compiler, reviser, translator, or illustrator
Volume number or number of volumes
Issue number
Place of publication
Publisher
Page numbers

Commas, full stops and colons are used to separate the elements. Some elements also require parentheses. Invert all authors' names so that the surname or last name is written first, then the authors' first names are abbreviated so that **Jennifer Smith would become Smith, J.** After the author name, the year of publication is added in parentheses; then the title of the article, with proper nouns and the first word of the title and subtitle capitalised; followed by the title of the journal (in italics and capitalised) and the volume number (in italics); then the issue number in parentheses. The page range is added last.

Like this template:
Author, A. A. (Year). Article title. *Journal Title, Volume*(issue), pages.

Bibliographic elements required:
Journal title: *Harvard Business Review*
Article title: *The quest for resilience*
Authors: *Gary Hamel and Liisa Valikangas*
Published in *2003, vol. 81, no. 9, pp. 52-63*
Each bibliographic element is positioned in the reference like this:

Ogbonnanya, A. E., Mounmbegna, E. P. and Monago, C. C. (2010). Effect of ethanolic extract of mistletoe (V*iscum album l.*) leaves on paracetamol-induced hepatotoxicity in rats. *Journal of Pharmacy Research, 3(8), 1888-1891.*

Periodical Print information examples	***In-Text Example***	***Reference List Example***
Journal article	Teto *et al*. (2007) found that … *OR* … (Teto ***et al***., 2007).	Teto, G., Alemnji, G., Nkenfou, C., Mbuagbaw, J., Tiyong, S., Somo, M. R. & Asonganyi, T. (2007). Evaluation de la capacité antioxydante chez les personnes infectées par Le *Plasmodium falciparum. Health Sciences and Disease, 8(1)*, 9- 14.
Magazine article	Walker (1990) identifies … *OR* … (Walker, 1990).	**For a monthly magazine, include the month in the date; for a weekly, include the day also.** Walker, R. (1990, April 16). Cultural continuities. *Listener*, *126*, 24-26.
Newspaper article	(Johnstone, 1992)	Johnstone, B. F. (1992, May 28). Treaty claim upheld. *The Daily Telegraph*, p. 2.

C. ELECTRONIC INFORMATION

Bibliographic elements that may be required to create a reference for electronic information are as follows:
Author or authors
Year of publication
Title of article
Title of publication
Title of series
Description of the work
Chapter title
Edition
Editor, compiler, reviser, translator, or illustrator
Ebook reader
Volume number or number of volumes
Issue number
Page numbers
DOI
Retrieval date (if the information is likely to change)
Database name
URL
Commas, full stops and colons are used to separate the elements. Some elements also require parentheses. Invert all authors' names so that the surname or last name is written first, then the authors' first names are abbreviated so that **Jennifer Smith would become Smith, J.** After the author name, the year of publication is added in parentheses; then the title of the article, with proper nouns and the first word of the title and subtitle capitalised; followed by the title of the journal (in italics and capitalised) and the volume number (in italics). The issue number, page range and retrieval information are in non italics. Like this template:
Author. (Year). Article title. *Journal title, Volume*(issue), pages. Retrieved from Database Name.

Bibliographic elements required:
Article title: *Design anthropology meets marketing*
Author: *G. Graffam.*
Journal title: *Anthropologica*
Published in *2010, vol 52, no 1, pp155-164*
Database: *ABI/Inform*

Each bibliographic element is positioned in the reference like this:

Graffam, G. (2010). Design anthropology meets marketing. *Anthropologica, 52*(1), 155-164. Retrieved from ABI/Inform database.

Electronic information examples	***In-Text Example***	***Reference List Example***
Electronic journal article (with DOI)	(Stultz, 2006)	Stultz, J. (2006). Integrating exposure therapy and analytic therapy in trauma treatment. *American Journal of Orthopsychiatry, 76*(4), 482-488. doi:10.1037/002-9432.76.4.482
Electronic journal article (from a database - no DOI)	(Friesen, 2005)	**For students, give the name of the database as in the example below. However, if you are submitting work to a publisher, give the URL of the journal homepage in place of the database name**. Friesen, G. B. (2005). Organization design for the 21st century. *Consulting to Management, 16*(3), 32-51. Retrieved from ABI/Inform database.
Electronic journal article (from the Web - no DOI)	(Cox and Sneyd, 2005)	**If no DOI has been assigned, provide the home page URL of the journal**. Cox, B., & Sneyd, M. (2005). Prospects for cancer control: Colorectal cancer. *New Zealand Medical Journal, 118*(1221). Retrieved from http://www.nzma.org.nz/journal/ **If the article has page numbers, these should be included after the issue number, in the format consistent with journal referencing.**

Preprint version of an article	(Gabbett, 2008)	Gabbett, T., and Benton, D. (2008). Reactive agility of rugby league players. *Journal of Science and Medicine in Sport.* [Advance online publication]. doi:10.1016/j.jsams.2007.08.011
Electronic book (with no DOI)	(White, 2003)	White, R. E. (2003). *Soils for fine wines* [ebrary Reader version]. Retrieved from ebrary database.
Newspaper article retrieved from the internet	(Cronshaw, 2008)	Cronshaw, T. (2008, February 15). Waging war on broom. *The Press.* Retrieved from http://www.stuff.co.nz
Web page with date, no author	("How to Breed Persian Cats," 1964)	How to breed Persian cats. (1964). Retrieved from http://www.catbreeders.co.uk
Web page with author, no date	(McApple, n.d.)	**A retrieval date (eg. Retrieved March 5, 2011 from http...) is no longer required for all online resources. It is only required for web sites such as wikis where content changes frequently**. McApple, J. (n.d.). An apple a day keeps the doctor away. Retrieved from http://www.applemania.org
Web page with no author and no date	("Gianni Versace Biography," n.d.)	Gianni Versace biography. (n.d.). Retrieved from http://www.thebiographychannel.co.uk/biographies/gianni-versace.html

Quotation examples	***In-Text Example***	***Reference List Example***
Direct quotations	**Material directly quoted from an author's work must be reproduced word for word. For quotations of fewer than 40 words incorporate the quotation in text and enclose with double quotation marks. Always include the page number of the quotation.** They found "the old schema is exercised by being used in familiar ways" (Claiborne and Drewery, 2010, p. 13). OR Claiborne and Drewery (2010) found that "the old schema is exercised by being used in familiar ways" (p. 13). **For quotation of 40 or more words display quotation in a free-standing block of typewritten lines, and omit the quotation marks. Indent the**	Claiborne, L. B., & Drewery, W. (2010). *Human development: Family, place, culture.* Sydney, Australia: McGraw-Hill.

	block 5 spaces. Claiborne & Drewery (2010) found: The old schema is exercised by being used in familiar ways. Play was seen by Piaget as a way for children to practise a schema. For example, a child who had learned to blow a whistle might want to blow it over and over, varying the noise only slightly, in order to practise the schema of producing the noise. (p. 13)	
Secondary source *(citing an author that has been cited within the reference material you are using)*	**In the text, name the original work and give a citation for the secondary source.** Seidenberg and McClelland's study (as cited in Coltheart, Curtis, Atkins, & Haller, 1993)	**Give the secondary source in the reference list** Coltheart, M., Curtis, B., Atkins, P., & Haller, M. (1993). Models of reading aloud: Dual-route and parallel-distributed-processing approaches. *Psychological Review, 100*, 589-608.

Other Sources examples	***In-Text Example***	***Reference List Example***
Annual reports	(Hawke's Bay Regional Council, 2010)	Hawke's Bay Regional Council. (2010). *Annual Report 2009-2010*. Napier, New Zealand: Author.
Audiovisual	(Howe and Newman, 1988)	**A description of the form of the work is given in brackets after the title**. Howe, D. (Producer), and Newman, G. (Director). (1988). *Sensitive communication* [Video]. Auckland, New Zealand: Society for the Intellectually Handicapped.
Blogs	(Freakonomics, 2010).	**The format description is in brackets after the title.** Freakonomics. (2010, October 29). E-ZPass is a life-saver (literally) [Blog post]. Retrieved from http://freakonomics.blogs.nytimes.com/2010/10/29/e-zpass-is-a-life-saver-literally/
Brochure	(Work and Income New Zealand, 2000)	Work and Income New Zealand. (2000). *Guidelines for interview preparation* [Brochure]. Wellington, New Zealand: Author. **If the brochure is an electronic version, include the name of the database or the URL of the website to identify from where it was retrieved.** Diabetes New Zealand. (2007). *Diabetes and physical activity* [Brochure]. Retrieved from http://www.diabetes.org.nz
Conference proceedings – print or electronic	(Gibson, 2005)	**Published conference proceedings may be cited either like chapters in edited books (first example) or like journal articles (second example). This will depend on whether the publication is**

		treated as a series (e.g. has an ISBN and an editor) or as a periodical (i.e. it is published annually). Gibson, C. C. (2005). In S. Allsop (Ed.), Impact of the larger social context on the distance learner. *International Council for Distance Education: One world many voices: Quality in open and distance learning* (pp. 279-282). Chicago, IL: Milton Keynes. Shennan, S. (2008). Canoes and cultural evolution. *Proceedings of the National Academy of Sciences 105*, 3416-3420. doi: 10.1073/pnas.0800666105
Figure (image, graph, chart, map, drawing, photograph)	**From a book – caption under figure:** *Figure 1*. The model of human needs (from Adair, 2006, p. 28) **From a journal article – caption under figure:** *Figure 2*. Asian food pyramid (from Escobar, 1999, p.76) **From the web – caption under figure:** *Figure 3*. Electrical system of the heart (from UKHealthCare, 2011)	**From a book** Adair, J. (2006). *Leadership and motivation: The fifty-fifty rule and the eight key principles of motivating others.* London, England: Kogan Page. **From a journal article** Escobar, A. (1999). Insight 2 April 1997: Are all food pyramids created equal? *Family Economics and Nutrition Review*, *12*(30), 75-77. Retrieved from ProQuest database. **From the web** UKHealthCare. (2011). UK heart transplant: Heart anatomy. Retrieved from http://ukhealthcare.uky.edu/transplant/heart/anatomy.asp

	If your work is going to be published, permission to use a figure must be obtained and credit given in the caption to the original author and the copyright holder. **Figure with permission – caption under figure:** *Figure 1*. Asian food pyramid. From "Insight 2--April 1997: Are all food pyramids created equal?" by A. Escobar, 1999, *Family Economics and Nutrition Review, 12*(3), p. 76. Copyright 1995 by Oldways Preservation & Exchange Trust. Reprinted with permission.	**Figure with permission** Escobar, A. (1999). Insight 2 April 1997: Are all food pyramids created equal? *Family Economics and Nutrition Review, 12*(3), 75-77. Retrieved from http://search.proquest.com **Even when a figure caption in-text has full details, the full reference is still required in the reference list as well. Remember that for work that is going to be published, if the source of the figure is an article without a DOI taken from a database, give the URL of the journal home page instead of the database name in the reference list.**
Using a Thesis or a Dissertation	Mounmbegna (2014) showed that … OR	Mounmbegna, P.P.E. (2014). Perfomance enhancing potential of plant extracts: a case study of four West African species (*sphenocentrum jollyanum, afromomum melegueta, pausinystalia yohimbe and vernonia guineensis).* [unpublished PhD Thesis]. University of Benin, Benin City.

	Plant extracts have performance enhancing potential (Mounmbegna, 2014).	
Personal Communication (letters, telephone conversations, emails, interviews)	(Edeh, E. M. P. personal communication, March 19, 2014)	N.B. No reference list entry as the information is not recoverable.

NOTE:

Referencing should be double-spaced, like the general text of the Seminar or Project document. All publications referred to in the text, tables or figures must appear in the reference list, and those mentioned in the reference list must be found in the text, tables or figures.

Philippe E. Mounmbegna
Ag Head, Department of Biochemistry

Attachment A: Format of Cover Page IT Report

STUDENTS' INDUSTRIAL WORK EXPERIENCE SCHEME (SIWES) TRAINING PROGRAMME REPORT (BCH 382) (Font 18, 1.15 line spacing, Centre Aligned, Bold

DONE AT: (Font 16, Centre Aligned, Bold)

MADONNA UNIVERSITY TEACHING HOSPITAL (MUTH) ELELE, P.M.B. 48, ELELE, RIVERS STATE (Font 16, 1.15 line spacing, Centre Aligned, Bold)

FROM 05TH MARCH 2014 TO 04TH OCTOBER 2014 (Font 16, Centre Aligned, Bold)

BY (Font 16, Centre Aligned, Bold)

ACHULIKE, SANDRA CHIAMAKA
BC/11/016 (Font 16, 1.15 line spacing, Centre Aligned, Bold)

DEPARTMENT OF BIOCHEMISTRY
FACULTY OF SCIENCE
MADONNA UNIVERSITY, NIGERIA (Font 16, 1.15 line spacing, Centre Aligned, Bold)

NOVEMBER, 2014 (Font 16, Centre Aligned, Bold)

Attachment B: Format of Cover Page **Seminar**

ANTI-VIRAL DRUGS STRATEGIES (Font 16, 1.15 line spacing, Centre Aligned, Bold

A SEMINAR PRESENTED BY (Font 16, Centre Aligned, Bold)

ACHULIKE, SANDRA CHIAMAKA
BC/11/016 (Font 16, 1.15 line spacing, Centre Aligned, Bold)

DEPARTMENT OF BIOCHEMISTRY
FACULTY OF SCIENCE
MADONNA UNIVERSITY, NIGERIA (Font 16, 1.15 line spacing, Centre Aligned, Bold)

NOVEMBER, 2014 (Font 16, Centre Aligned, Bold)

Attachment C: Format of Cover Page **Project**

EFFECTS OF *MORINGA OLEIFERA* LEAF EXTRACT ON SOME BIOCHEMICAL PARAMETERS IN STRESS-INDUCED ALBINO RATS (Font 16, 1.15 line spacing, Centre Aligned, Bold)

BY (Font 16, 1.15 line spacing, Centre Aligned, Bold)

ESANGBEDO, DORIS ENIMIEN
BC/T/10/085 (Font 16, 1.15 line spacing, Centre Aligned, Bold)

DEPARTMENT OF BIOCHEMISTRY
FACULTY OF SCIENCE
MADONNA UNIVERSITY, NIGERIA (Font 16, 1.15 line spacing, Centre Aligned, Bold)

AUGUST, 2014

Attachment D: Format of Cover Title IT Report

STUDENTS' INDUSTRIAL WORK EXPERIENCE SCHEME (SIWES) TRAINING PROGRAMME REPORT (Font 18, 1.15 line spacing, Centre Aligned, Bold)

DONE AT: (Font 16, Centre Aligned, Bold)

MADONNA UNIVERSITY TEACHING HOSPITAL (MUTH) ELELE, P.M.B. 48, ELELE, RIVERS STATE (Font 16, 1.15 line spacing, Centre Aligned, Bold)

FROM 05TH MARCH 2014 TO 04TH OCTOBER 2014 (Font 16, Centre Aligned, Bold)

BY (Font 16, Centre Aligned, Bold)

ACHULIKE, SANDRA CHIAMAKA
BC/11/016 (Font 16, 1.15 line spacing, Centre Aligned, Bold)

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF BACHELOR OF SCIENCE (B.Sc.) IN BIOCHEMISTRY (Font 16, 1.15 line spacing, Centre Aligned, Bold)

DEPARTMENT OF BIOCHEMISTRY
FACULTY OF SCIENCE
MADONNA UNIVERSITY, NIGERIA (Font 16, 1.15 line spacing, Centre Aligned, Bold)

NOVEMBER, 2014 (Font 16, Centre Aligned, Bold)

Attachment E: Format of Cover Title Seminar Report

ANTI-VIRAL DRUGS STRATEGIES (Font 16, 1.15 line spacing, Centre Aligned, Bold

A SEMINAR PRESENTED BY (Font 16, Centre Aligned, Bold)

ACHULIKE, SANDRA CHIAMAKA
BC/11/016 (Font 16, Centre Aligned, Bold)

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF BACHELOR OF SCIENCE (B.Sc.) IN BIOCHEMISTRY (Font 16, 1.15 line spacing, Centre Aligned, Bold)

DEPARTMENT OF BIOCHEMISTRY
FACULTY OF SCIENCE
MADONNA UNIVERSITY, NIGERIA (Font 16, 1.15 line spacing, Centre Aligned, Bold)

SUPERVISOR: PROF. MONAGO C.C. (Font 16, Centre Aligned, Bold)

NOVEMBER, 2014 (Font 16, Centre Aligned, Bold)

Attachment F: Format of Cover Title Seminar Report

EFFECTS OF *MORINGA OLEIFERA* LEAF EXTRACT ON SOME BIOCHEMICAL PARAMETERS IN STRESS-INDUCED ALBINO RATS (Font 16, 1.15 line spacing, Centre Aligned, Bold)

BY (Font 16, 1.15 line spacing, Centre Aligned, Bold)

ESANGBEDO DORIS ENIMIEN
BC/T/10/085 (Font 16, 1.15 line spacing, Centre Aligned, Bold)

A PROJECT RESEARCH SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF BACHELOR OF SCIENCE (B.Sc.) IN BIOCHEMISTRY (Font 16, 1.15 line spacing, Centre Aligned, Bold)

DEPARTMENT OF BIOCHEMISTRY
FACULTY OF SCIENCE
MADONNA UNIVERSITY, NIGERIA (Font 16, 1.15 line spacing, Centre Aligned, Bold)

SUPERVISOR: DR. MOUNMBEGNA P.P.E (Font 16, Centre Aligned, Bold)

AUGUST, 2014 (Font 16, Centre Aligned, Bold)

Attachment G: Format of Certification for IT Report

CERTIFICATION

This is to certify that **Achulike, Sandra Chiamaka** (written bold), an undergraduate student in the Department of Biochemistry, Faculty of Life Sciences with Registration Number BC/11/016 of Madonna University Nigeria has completed training in Madonna University Teaching Hospital (MUTH) Elele (Name of Company) for a period of Six (6) months from 05th March 2014 to 04th October 2014, under my guidance. His performance has been satisfactory so as to fulfill all the requirements for successful completion of the training and award of degree of B.Sc. (Biochemistry). During his tenure with us we found her sincere and hard working. Wishing her a great success in the future.

This document is a bona fide testimony of the trainings undergone and works carried out by her in this course. I hereby certify that it is worthy of acceptance.

Signature
---------- ----------
(Name of IT Supervisor) Date
(IT Supervisor) (single spacing)

Signature
---------- ----------
(Name SIWES coordinator) Date
(SIWES coordinator) (single spacing)

Signature (with Departmental seal)
---------- ----------
(Name HOD) Date
(Head of Department) (single spacing)

Attachment H: Format of Certification for Seminar or Project

CERTIFICATION

Esangbedo Doris Enimien an undergraduate student in the Department of Biochemistry, with registration number BC/T/10/085, has satisfactorily completed the research (or Seminar) requirements for the award of a Bachelor of Science (B.Sc.) Degree in Biochemistry.

Signature
---------- ----------
(Name of Project/Seminar Supervisor) Date
(Project or Seminar Supervisor) (single spacing)

Signature
---------- ----------
(Name Project/Seminar Coordinator) Date
(Project or Seminar coordinator) (single spacing)

Signature (with Departmental seal)
---------- ----------
(Name HOD) Date
(Head of Department) (single spacing)

Signature
---------- ----------
(Name of External Examiner) Date
(External Examiner) (single spacing)
Applicable for Project only

Attachment I: Format of Table of Content for Project

TABLE OF CONTENTS

Attachment J: Format of List of Tables / Figures / Plates

LIST OF TABLES

Attachment K: Format of List of Symbols / Abbreviations

LIST OF SYMBOLS / ABBREVIATIONS (if applicable)

c_p	specific heat capacity, J/(kg·K)
G	specific mass flow rate, kg/s
h	height, m
α	homogeneous void fraction
η	pressure ratio
CK	Creatine kinase
DMSO	Dimethyl sulfoxide
MAP	maximum allowable pressure, kPa
MAWP	maximum allowable working pressure, kPa
$O_2^{\bullet-}$	Superoxide radical

Attachment L: Format of List of References

REFERENCES

Abere, S.A. and Lameed, G.A. (2008). The medicinal utilization of snails in some selected states in Nigeria. In: *Proceeding of the first National conference of the Forests and Forest Products Society (FFPs)*. Onyekwelu, J.C., Adekunle, V.A.J. and Oke, D.O. (eds.).Held in Akure, Ondo State between 11th and 18th of April, 2008. Pp 233 – 237.

Aboelella, N.W., Reynolds, A.M. and Tolman, W.B. (2004). Catching copper in the Act. *Science*; **304**: 836 – 837.

Ademosun, A.A., Omidiji, M.O. (1999). The nutrient value of African giant land snail (*Archachatina marginata*). *Journal of Animal Protection Resear*ch **8**(2): 876 – 877.

Adeyeye, E.I. (1996). Waste yield, Proximate and mineral Composition of three different types of land snail found in Nigeria. *International Journal of Food Science and Nutrition* **42**(2): 111-116.

Adman, E.T. (1991). Copper protein structures. *Advances in Protein Chemistry*; **42**: 145 – 197.

Agbogidi, O. M. and Okonta, B. C. (2011). Reducing poverty through snail farming in Nigeria Agriculture *and Biology Journal of North America*, **2**(1): 169-172.

Akande, I. S.1., Odetola, A. A., Samuel, T. A.1. and Okolie, P.N. (2010). Biochemical evaluation of aestivation and starvation in two snail species. *African Journal of Biotechnology*, **9**(45): 7718-7723.

Akinnusi, O., (1998). A practical approach to backyard snail farming. *Nigeria Journal of Animal Production*, **25**: 85-95

Ali, B.A., Zaidi, Z.H., and Abbasi, A. (1995). Oxygen transport proteins, I. Structure and organization of haemocyanin from scorpion (*Buthus sindicus*). *Comparative Biochemistry and Physiology*; **112A**: 225 – 232.

Ando, K. (2008). Ligand-to-metal charge-transfer dynamic in a blue copper protein plastocyanin: A molecular dynamic study. *Journal of Physical Chemistry*; **B112**: 250 – 256.