



REQUIREMENTS FOR PHARMACIST TRAINING PROGRAMME AS DOCTOR OF PHARMACY

1 Background

- 1.1. The Pharmacy Council of The Gambia (PCG) is mandated to determine the standard of knowledge and skill to be attained by persons seeking to become members of the pharmacy profession.
- 1.2. The syllabus which shall be covered to pass the PCG pre-registration examination is listed in the PCG *Guideline for Pre-Registration Examination*. The following requirements shall be fulfilled for accreditation of curriculum for training of students to be awarded a degree certificate as Doctor of Pharmacy (PharmD).
- 1.3. The ultimate goal of the programme shall be to train the student with the knowledge, attitudes and skills to provide comprehensive pharmaceutical services. At the end of the training a graduate should be able to:
 - Contribute to the development and implementation of national, regional medicines and pharmaceutical policies;
 - Design, develop, formulate, produce, distribute and dispense high quality, safe and effective medicines and related products;
 - Assure the rational use of medicines and related products;
 - Manage pharmaceutical laboratory services;
 - Manage Medicines Control/Quality Assurance agencies;
 - Promote use of herbal and other alternative medicines;
 - Counsel and monitor patients as well as promote and document their appropriate medicine treatment;
 - Promote public health; and
 - Become a life-long learner.

2 Curriculum Requirements

- 2.1. The overall duration of the training programme shall be six (6) years. This duration shall include a twelve-months internship to be conducted by PCG after degree certification by training institution.
- 2.2. The Pharmacist training programme should be structured so as to provide the student with knowledge and competencies in the following areas of training:
 - Basic and Biomedical Science;

- Pharmaceutical Sciences; and
 - Pharmacy Practice
- 2.3. The institution may offer core and elective courses. The load of the core courses should be at least 60% of total credit required to graduate.
- 2.4. In the last semester/trimester the student should write a Thesis on a research topic guided by a supervisor and structured into: Abstract, Objectives, Methods, Results and Conclusion.
- 2.5. Each training course should be evaluated using a combination of continuous assessments and assessments at the end of the semester/trimester. Continuous semester/trimester assessment shall consist of term papers, laboratory reports and/or tests (written, oral or practical, tutorial, attendance etc. as deemed fit by institution). The assessment at the end of semester/trimester shall consist of written and/or oral and practical examinations. The final evaluation at the end of training shall consist of written, oral and practical examinations.
- 2.6. The minimum pass mark for core courses shall be fifty per cent (50%).
- 2.7. The description of the courses should be of such that it is developed along the following sequence or contains all elements mentioned therein:
- Code and Title of courses and subject areas;
 - Objective(s);
 - Topic(s)/Content(s);
 - Teaching methodology;
 - Evaluation; and
 - Reference books/materials.
- 2.8. Each course should have a code and a descriptive title. The code should have, at least, a literal component and a numerical part following it.

3 Curriculum Goals and Objectives

3.1 Basic and Biomedical Science

English

- To enhance students' ability to read, write, speak and understand English used in college or university
- To prepare the students for successfully managing the challenges of studying at a university with courses conducted in English, focusing on proficiency in reading large amounts of scientific material, completing written assignments, examinations, and projects, and delivering academic oral presentations

Psychology

- To obtain a global view of the human being and his development, understanding the human as a biopsychosocial unit
- To know the principles and fundamental methods of Scientific Psychology
- To know and understand the different aspects involved in human behaviour and be able to understand the relations between the different aspects and its consequences in conduct
- To learn to analyse human behaviour in everyday life, including the comprehension of behaviour itself

Sociology

- To value the importance of the scientific study of society
- To analyse in a general way the historical development of the Social Sciences
- To examine the object of study of the different Social Sciences determining their fundamental problems
- To manifest positive positions toward the interpretation and investigation of the social phenomena
- To express leadership qualities in the discussion of the characteristics of the present African Society
- To provide understanding of pharmacy within the context of individual and socio-cultural factors that affect medicines use and health

Mathematics (Algebra and Trigonometry, Calculus)

- To provide students with the basic mathematical knowledge
- To strengthen the capacity of the students in the field of mathematical analysis
- To recognise the importance of mathematics in its application in different areas, such as management, economy, computer Science, etc

Physics (General, Biophysics)

- To help the student understand the various theories and concepts in physics that may be encountered during his/ her training and practice
- To identify the fundamental principles of physics
- To familiarise students with the knowledge of optics, mechanics of fluids, radioactive decay and dimension equations etc
- To establish the relation between physics, technology and medicine
- To apply the acquired knowledge to the study of biophysics with orientation toward the physiology of the human organism

Chemistry (General, Inorganic, Organic, Physical chemistry)

- To give the student, a foundation in the field of Atomic Chemistry and Quantum Physics

- To introduce the student to the physico-chemical properties, preparation and uses of the elements of the periodic table and their compounds of pharmaceutical importance
- To introduce the student to the understanding of the mechanisms of redox-reactions, electrochemistry and acid-base reactions
- To equip the student with skills in the area of titrimetric analysis
- To emphasise the chemical basis for the pharmaceutical uses
- To analyse the acid-basic reactions and to present the facts that contribute to the contamination of the environment; and specific and practical solutions for this problem
- To train students for a better understanding of the chemical changes (reactions) that matter undergoes
- To give a more complete view of the wide variety of matter that exists and the great importance that encloses the application of chemical knowledge in the present world

Environmental Science

- To recognise the principal environmental problems and their implications in the social, economical and political aspects
- To interpret the basic ecological principles on the flow of matter and energy within the ecosystem and the interrelationships between man and his environment
- To recognise the importance of developing a management policy that will permit environmental protection and resource conservation
- To develop a critical attitude towards environmental problems

Biology (General and Cellular Biology, Botany, Zoology)

- To interpret the general concepts and theories of the biological sciences
- To determine the characteristics of living organisms and the biological processes that are evident in them
- To interpret the present concepts and theories concerning the knowledge of the cell
- To integrate the knowledge of structure, physical and chemical composition and the functions of the different cellular components that make the cell the basic unit of life
- To establish the existing relationship between the structure and form of living organisms
- To interpret the bio-energetic processes and their mutual correlation in maintaining metabolic activity
- To recognise the basic processes involved in the reproduction, heredity and evolution of organisms
- To introduce the student to the study of general and systematic botany

- To have a thorough overview of non-flowering plants and their medicinal importance including use in medicine research and development
- To give to the student knowledge about the organisation of the animal kingdom especially that of protozoans and metazoans and also insect vectors of parasitic diseases

Biochemistry (General, Metabolic and Enzymatic Biochemistry, Food and Water Analysis, Clinical Biochemistry)

- To describe the structure of simple and complex molecules found in biological systems and their precursors involved in the living cells
- To describe the nature of enzymes and the process of enzyme catalysis as the basis of intermediary metabolism
- To explain the processes by which the cell obtains energy from oxidation of nutrients analysing the relationship between the major anabolic and catabolic pathways
- To interpret the role of carbohydrates, lipids, proteins and nucleic acid metabolism in normal and selected common diseases states
- To describe the process of genetic information transference and its regulation
- To introduce the student to the analytical study of foods (milk, fish, cans, etc.)
- To understand the role of water in the quality of life as well as the analytical, toxicological and bacteriological aspects of water
- To introduce students to the general principles of clinical biochemistry and clinical applications in interpreting results of disease states

Anatomy

- To familiarise the students with the basic concept of anatomy and understand the organisation of the human structure

Embryology

- To understand the different stages of embryonic development and physiological interactions of mother-child

Human Physiology

- To familiarise the students with the basic concept of Physiology
- To enable students to understand how the human body works
- To develop an in-depth knowledge of cellular physiology and signalling
- To develop a thorough understanding of the neural, cardiovascular and endocrine systems

Haematology

- To familiarise students with the basics of haematology
- To provide the students with knowledge of the techniques used in medical laboratory diagnosis of diseases

- To understand to correctly interpret results of the laboratory analysis for the determination of biological parameters that help to diagnose the disease

Immunology

- To introduce students to the basic principles of the mammalian immune system and the common immunological disorders which are seen particularly in humans
- To provide students with the knowledge of the pathophysiology, signs and symptoms of immune system diseases and their diagnoses together with guiding techniques for their management

Microbiology (Bacteriology, Mycology and Virology)

- To provide the students with general knowledge about the biology of bacteria, fungi and viruses, and their significance

Parasitology

- To understand the identification of the parasite, its life cycle in humans and the pathophysiology of infections
- To understand sampling techniques, diagnostic methods, analysis and interpretation of results

Statistics (Descriptive and Inferential Statistics, Biostatistics)

- To strengthen the capacity of the students in the field of descriptive statistics and statistical analysis
- To familiarise the student with the most important concepts of the methodology used in biostatistics
- To prepare the student to understand, value and apply statistical methods in the field of health
- To ensure that the student is able to use and evaluate biostatistics in pharmacy practice and academic research
- To enable the student to answer a research question or to test a hypothesis, select an appropriate statistical test, analysing data using a statistical computer package, explain and evaluate the results, and apply the results to decisions about research and practice

Informatics (Information & Communication Technology, Applied Informatics for Pharmacy)

- To equip students to become computer literate (e.g. to introduce the student to the main Windows application and any other relevant contemporary computer programme and its interface, tools and features)
- To introduce the student to the application of Information Technology to the practice of pharmacy, in particular, and health delivery in general
- To acquaint students with the applications of computers and information and communication technologies (ICT) to pharmacy and medicine

- To assist students to apply the knowledge in the applications of computers and information and communication technologies to pharmacy practice

3.2 Pharmaceutical Sciences

Pharmaceutical Chemistry

- To provide an introduction of chemical principles to students in order to facilitate understanding of the physicochemical properties of medicine molecules
- To provide knowledge about the nomenclature and structure including stereochemistry of medicine molecules
- To provide understanding of medicine development and design as well as those principles that relate to pharmacology and drug metabolism

Pharmaceutical Analysis

- To understand the use of monographs for (pharmaceutical/medicine) analysis

Medicinal Chemistry

- To make the students understand the process of medicine interaction at the receptor sites
- To enable the students relate molecular structures to biological activities

Pharmaceutical Biochemistry

- To understand the molecular chemistry and reactions related to pharmaceutical targets

Biopharmaceutics

- To introduce students to the issues associated with the pre-formulation of medicines and the design of their dosage forms with regards to their physicochemical properties, composition and the actions of the body on them
- To understand the various physiological processes that medicines undergo in the human system
- To understand medicine absorption, transport, distribution, metabolism, and excretion

Pharmaceutical Microbiology & Biotechnology

- To introduce the students to pharmaceutical microbiology and the techniques of genetic engineering and fermentation as used in the pharmaceutical industry for the production of active ingredients and medicine manufacturing.

Pharmacognosy

- To enable the students to
 - give account of the plant kingdom as repositories of pharmacologically active molecules
 - explain the structural diversity of natural products

- describe the physical and chemical properties of the different classes of natural products
- plan and carry out laboratory procedures for basic extraction and identification of various classes of natural products
- identify a selection of the most important medicinal plants
- explain the uses of a selection of the most important medicinal plants
- describe the pharmaceutically active compounds in these selected plants
- To enable the student to explain the factors that affect crude drug production and development and be able to describe the basic principles involved in their evaluation
- To understand and detect adulteration of commonly used medicinal plants
- To explain the basic principles underlying various chromatographic techniques
- To enable the students to describe and use techniques in the quality control of crude drugs

Pharmacology (General, Molecular and Applied Pharmacology)

- To enable the students to understand the behaviour of the medicine from its administration until its removal from the body
- To introduce the students to general and molecular pharmacology and its application to therapy

Basic and Clinical Pharmacokinetics

- To describe absorption, distribution, metabolism and excretion (ADME) as it applies to medicines
- To understand drug concentration time and concentration effect relationships and clinical applications
- To explore kinetic processes of drug absorption, distribution, metabolism, and excretion
- To learn concepts and perform calculations of drug half-life, volume of distribution, area under plasma concentration-time curve, and clearance
- To understand the pharmacokinetic (PK) and pharmacodynamic (PD) relationship pertaining to medicine response variability and medicine monitoring
- To clinically dose and monitor therapy for those medicines with narrow therapeutic indices, using knowledge of age, disease, renal function and medicine interactions on medicine disposition

General and Emergency Toxicology

- To acquire knowledge of poisons and other common toxicants
- To understand the concepts of care in emergency toxicology and the causes of toxicity
- To introduce students to monographic aspects of some poisons

Cosmetology

- To enable students to have knowledge, including the benefits, dangers and the rational mode of application of chemicals and drugs used in cosmetics/aesthetics and beautification procedures
- To enable students to understand the benefits and disadvantages of different cosmetic products in different disease conditions

Agrochemicals and Veterinary Pharmacy

- To provide students with the understanding, use and the dangers of agrochemicals
- To provide students with the knowledge of medicines that are used to treat common diseases in animals

3.3 Pharmacy Practice

Pharmaceutical Practice and Calculations

- To explore the field of pharmacy and introduce students to pharmaceutical practice
- To expose students to the important current issues surrounding pharmacy practice
- To provide students the knowledge in the use of mathematical formulas and equations to accurately dose a variety of patient populations and well as compound pharmaceutical preparations

Pathology (Medical, Surgical and Infectious Pathology)

- To provide the students with pathological basis of non-infectious and infectious diseases that are commonly seen in clinical practice

Pathophysiology

- To provide understanding of mechanisms of disease processes
- To introduce the students to the techniques of clinical investigation of body disorders with use of their associated signs and symptoms so as to make appropriate diagnosis of said dysfunctions

Health Psychology

- To familiarise students with the impact of psychological factors in the development and management of diseases

Patient Assessment

- To learn how to properly record results of a physical assessment
- To introduce the students to interpretation of recorded results
- To learn and apply terminology used in patient assessment
- To be able to differentiate normal and abnormal physical findings

Emergency Medical Intervention (First Aid)

- To introduce students to the various standard procedures used to rescue a person who is in danger

- To introduce students to the technique of external cardiac massage, washing techniques to chemical exposure and the provision of care for the survival of the patient prior to transport to the hospital

Traditional and Herbal Medicine

- To help students to understand the concepts of African Traditional Medicine and other major complementary and alternative medicines (CAM)
- To enable students to explain the role of traditional medical practice in healthcare delivery in developing countries
- To advocate for the use of quality, safe and efficacious herbal medicines

Pharmaceutical Care

- To enable the students to understand the concepts and philosophy of pharmaceutical care and their applications

Pharmacotherapy

- To acquire in-depth knowledge about medicine therapy for various conditions and diseases

Professional Communication

- To prepare students for professionalism, leadership, administration, career opportunities, practical issues affecting pharmacy, and communication skills; all of which influence patient care and pharmacist counseling

Pharmaceutics

- To recognise and understand the function of numerous ingredients in pharmaceutical products
- To introduce the students to various formulation techniques including colouring and flavouring
- To understand and be able to recognize various mechanisms of drug release in different dosage forms
- To understand principles and factors controlling medicine stability and bioavailability
- To learn the principles regarding the development of drug delivery systems

Industrial Pharmacy

- To introduce the students to the basic industrial technology for the manufacture of medicines including compendia of pharmaceutical preparations
- To help students to acquire knowledge in specific manufacturing techniques and control procedures during manufacture of medicines and Good Manufacturing Practice (GMP)
- To allow the students to have good knowledge of the steps involved in designing, manufacturing, packaging, storage and quality assurance in the pharmaceutical industry

- To introduce the students to the concepts of conditions of hygiene and safety in the pharmaceutical industry
- To understand the numerous stages in drug development and clinical testing
- To become familiar with the patent and regulatory processes regarding drug development

Pharmaceutical Compounding and Medicine Delivery

- To know how to prepare safe and effective pharmaceutical products and correct procedures for compounding and its application to pharmacy practice
- To expose students into medicine dispensing in pharmacy settings, with focus on knowing and using or handling contemporaneous pharmaceutical including biotechnology made products

Prescription Assessment/Evaluation

- To enable the student to verify the authenticity and evaluate prescriptions

Intravenous admixtures

- To provide students the knowledge regarding the theory, preparation, route of administration and application for sterile products

Pharmacy Ethics, Law and Regulations

- To provide knowledge to the students about the legal and ethical frameworks and tools so as to be able to resolve ethical and legal questions, dilemmas and challenges that are encountered in conducting professional services
- To define the roles of ethics in healthcare and specifically in pharmacy practice and understand the Code of Ethics for Pharmacists
- To provide an insight into how the practice of pharmacy is regulated in different parts of the world and in The Gambia
- To discuss several organisations devoted to the regulating the pharmacy profession
- To provide knowledge about penalty in the illegal practice of pharmacy

Medicine Information Services (Evidence Based Practice)

- To enable students to acquire competences of designing and utilizing evidence-based medicine information for rational use of medicines
- To provide the necessary tools and skills to access the most up-to-date and accurate medicine information
- To prepare students to properly interpret medicine information and literature
- To prepare students to effectively present medicine information and studies

Public Health (Community Health and Healthcare systems, Health Economics (Pharmacoeconomics), Pharmacovigilance and Pharmacoepidemiology)

- To provide understanding of the role of pharmacists in public health
- To facilitate the implementation and evaluation of the community's local,

national and/or international health projects

- To understand the basics of a multidisciplinary and multi-professional approach to health promotion in general and community health in particular
- To enable students to appreciate the place and role of pharmacy in healthcare system
- To provide an insight into healthcare systems and the implications for pharmacy practice
- To learn about different healthcare facilities and the corresponding role for pharmacists
- To learn about the pharmaceutical industry and issues affecting pharmaceutical products
- To enable students to understand and apply pharmacoeconomic concepts in pharmacy practice
- To provide understanding of the concepts of Pharmacovigilance and Pharmacoepidemiology and their application

Nutrition and Dietetics

- To provide the basis and role of nutrition in the maintenance of good health

Research Methodology and Scientific Writing

- To introduce students to research methodology
- To introduce students to research information including online research of journals as well as to the different techniques of presentation of references
- To enable the students to make scientific reports both in writing and orally

Biomedical Analysis

- To give students the opportunity to develop adequate laboratory skills with reference to biomedical applications
- To allow the students to have knowledge of good practices in a laboratory
- To assist students to acquire knowledge of the tools required for the development of quality within an analytical laboratory
- To provide the students with knowledge and skills in the conduct of analysis, and the validation of results
- To teach students about the principles of prevention and management of laboratory-based risk

Commercial Law

- To introduce students to the general provisions of commercial law

Pharmacy Management

- To ensure the understanding and application of management knowledge and skills in pharmacy practice

Professional Communication

- To prepare pharmacy students for the profession with focus on professionalism, leadership, administration, career opportunities, practical issues affecting pharmacy, and communication skills

Community and Hospital Pharmacy

- To provide introductory information and prepare students for required experience in a community or hospital pharmacy setting as a pharmacist intern
- To introduce students into pharmacy management, accounting and administration

Cross-refer to internship