

LIST OF TOPICS

Taught various general and special topics in Biochemistry, Clinical Biochemistry and Molecular Biology:

General Biochemistry:

- Structures and Functions of components in the animal cell;
- Water, pH-scale and Buffers;
- Acid-Base Balance,
- Electrolyte Balance;
- Regulation of Blood pH;
- Building Blocks: Structures and Functions of:
 - Carbohydrates,
 - Amino Acids,
 - Polypeptides and Proteins,
 - Lipids and related compounds,
 - Nucleotides & Nucleic Acids (RNA and DNA)
- Structure and Function of the Biological Membranes, including cell signalling and transport of molecules;
- Bioenergetics:
 - Free Energy Change,
 - Gibbs Free Energy,
 - High-Energy Phosphate Compounds,
 - Electron Transport Chain,
 - Oxidative Phosphorylation and Superoxide;
- Enzymes (including kinetics and regulation);
- Digestion and Absorption;
- Metabolism: Significance and Interrelationship of Metabolic Pathways (Anabolic, Catabolic and Amphibolic pathways); Metabolism of Carbohydrates, Lipids, Nitrogen and Nucleotides,
- Biosynthesis and Regulation of Heme;
- Introduction to Hormones and Hormonal Control: Insulin, Glucagon, Thyroid Hormones, Catecholamines, Sex Steroid hormones,

Special Topics in Biochemistry:

- Integration of Metabolism and Metabolism of specialised tissues
 - Flow and Control of Key Metabolites,
 - Blood,
 - Muscle Contraction,
 - Pain & Stress,
 - Vision,
- Feeding – Fasting Cycle,
- Xenobiotics: Drug Metabolism (Biotransformation of drugs),
- Metabolic Disorders: In-born Errors of Metabolism:
 - Glucose-6-Phosphate Dehydrogenase Deficiency,
 - Cyanosis – Causes and Consequences,
 - Phenylketonuria, Albinism, Alkaptonuria
- Introduction to Neurochemistry,
- Basic Nutrition,
- Introduction to Immunochemistry,
- Quality Control (QC) and Quality Assurance (QA) in Clinical and Experimental Biochemistry Laboratories,
- Research Methods (including basic biostatistics)

Clinical Biochemistry Topics:

- Requesting and Interpreting Clinical Biochemistry Tests and Results;
- Fluid distribution (body compartments),
- Fluid Balance (Diagnostic significance)
- Sodium and Potassium Balance,
- Acid-Base Balance & Base Excess (Diagnostic significance)
- Metabolic and Respiratory Acidosis and Alkalosis including Compensatory Mechanisms
- Renal Function (Including Acute and Chronic Renal Failure, Renal Tubular Acidosis),
- Oxygen Transport (Haemoglobin: Structure function relationship: Embryonic, Foetal, Adult)
- Disorders of Calcium and Phosphate Metabolism (Diagnostic significance)
- Enzymes in Clinical Diagnosis
- Gastric, Pancreatic and Intestinal Disorders (Diagnostic significance)
- Liver Function Tests: Neonatal Jaundice, Classification of Jaundice (Diagnostic significance)
- Metabolic Disorders: Carbohydrate (Diabetes Mellitus, Gestational Jaundice), Disorders of Plasma Lipids and Lipoproteins, Hypercholesterolemia
- Disorders of Purine Metabolism (Gout; Diagnostic significance)
- Anaemia, Iron deficiency Anaemia (Diagnostic significance)
- Disorders of Porphyrin Metabolism (Porphyria)
- Thyroid function Tests (Interpretation and Diagnostic significance)
- Disorders of Adrenal Cortex and Medulla Functions (Adreno-cortical failure: Diagnostic tests);
- Hypothalamic and Pituitary Hormones (Diagnostic tests)
- Sex Steroid hormones (Gonadal Dysfunction, Diagnostic tests and interpretation);
- Clinical Toxicology (Diagnostic tests and interpretation)
- Molecular Biology as a tool in Clinical Biochemistry (PCR, ELISA, EIA)
- Endocrinology – Diagnostic Applications,
- Critical Analysis of Research Data

Molecular Biology Topics:

- Storage and Expression of Genetic Information
- Protein Synthesis, including Post-Translation Modification of Proteins,
- Drugs and Inhibitors of Protein Synthesis, Mutations and Repairs of DNA,
- Recombinant DNA (Major analytical techniques, Cloning),
- Regulation of Gene Expression,
- Molecular Basis of Cancer, Viruses (including HIV/AIDS).

Problem Based Learning (PBL) Topics: School of Medicine and Health Sciences, University of Papua New Guinea: Taught the following Patient & Community (P & C) related Biochemistry topics:

- Need for Oxygen,
- Understanding Acids, pH and Buffers,
- Water and Sodium Homeostasis,
- Potassium Disorders,
- Oedema,
- Investigation of Renal function,

- Hyperuricaemia, Renal Calculi,
- Metabolic Acid-Base Disorders,
- Respiratory and Mixed Acid-Base Disorders,
- Plasma Proteins – Immunoglobulins,
- Malignancy and Cachexia, Catabolic State,
- Metabolic Interplay in Cancer,
- Snake Venom – Biochemical effects,
- Oxygen Transport and Bilirubin Metabolism in Neonates, Jaundice,
- Acute and Chronic Ethanol Effects,
- Liver Function Tests, (Diagnostic significance)
- Biochemistry of Vision,
- Diagnosis and Monitoring of Diabetes Mellitus,
- Diabetic Ketoacidosis – Biochemical Basis,
- Gestational Diabetes, Adrenal Diabetes,
- Intravascular Haemolysis,
- Urinalysis (Diagnostic significance)
- Normal Puberty,
- Causes and Consequences of Obesity,
- Insulin Resistance, Polycystic Ovarian Syndrome,
- Lipoprotein Metabolism, Malabsorption, Dyslipidemia
- Anaerobic Glycolysis
- Atherogenesis (Biochemical basis, Risk factors, Types of Angina pectoris),
- Myocardial Infarction (Laboratory Diagnosis of MI, CK-MB, Interpretation of data)
- Normal Haemostasis,
- Synovial Fluid,
- Pain and Eicosanoids,
- Regulation of Haemopoiesis,
- Metabolic Response to Injury,
- Parenteral Nutrition,
- Iron Metabolism (Classification of anaemia),
- Steroidogenesis
- Oxidative Stress (causes and consequences), Role of free radicals and reactive oxygen species in diseases
- Prostaglandins (Clinical significance)
- Investigation of Hypothyroidism and Hyperthyroidism,
- DNA Diagnosis – Using Polymerase Chain Reaction

Additional courses taught in Fourah Bay College and College of Medicine and Allied Health Sciences, University of Sierra Leone:

- Basic Thermodynamics: First, Second & Third Laws, Gas Laws, Equilibrium State, Steady state (living cell)
- Organic Chemistry,
- Natural Product Chemistry
- Cell Biology
- Some aspects of Basic Physiology