

SYLLABUS

NAME OF COURSE: Biochemistry 1 - CHEM 121

LENGTH OF COURSE: 3.5 units; 55 hours (5 hrs lecture per week)

COURSE DESCRIPTION:

Biochemistry 1 studies the structure, function and performance relationships of biochemical compounds, including amino acids, nucleic acids, proteins, vitamins, enzymes, carbohydrates, lipids, and pH buffer systems. Energy metabolism and reaction rate kinetics are emphasized in the context of the regulation of integrated cellular metabolism.

PREREQUISITES: PHYS 115, ANAT-110, ANAT-610

COURSE OFFERED BY: Basic Sciences Department

REQUIRED TEXT: Harvey and Ferrier, Biochemistry: Lippincott's Illustrated Reviews, 6th ed., (2014).

RECOMMENDED

TEXTS:

Murray, Harper's Illustrated Biochemistry, 29th ed., (2012).

McKee and McKee, Biochemistry: The Molecular Basis of Life, 5th ed., (2014).

Meisenberg and Simmons, WH, Principles of Medical Biochemistry, 3rd ed., (2012).

Baynes and Dominiczak, Medical Biochemistry, 3rd ed., (2009).

MATERIALS:

Handouts and grades will be posted on the CANVAS website learning environment.

METHOD OF INSTRUCTION:

Powerpoint/Keynote lectures, in-class assignments, small group activities, discussion, in-class critique and exams

EVALUATION and GRADING:

Grades will be based on three examinations (two midterms and one final) and in-class assignments.

Midterm 1	20%
Midterm 2	20%
Final exam	20%
In-class assignments	40%

A=90-100% B=80-89% C=70-79% F=0-69%

All work submitted to the instructor must be original work of each student and done independently by the student unless the instructor authorizes group collaboration.

****The CANVAS website is used for all posted notes, electronic copies of handouts, lecture materials and grades. Each student must create an individualized account****

Grades and the Grading System Final Grades are available online through the CAMS student portal. If there are any questions on grading procedures, computation of grade point average, or the accuracy of the grade report, please contact the Registrar's Office or the Office of Academic Affairs. Grades will be reported and evaluation will be based on the Academic Policies, Procedures, & Services. Please refer to Evaluation Policy (**Policy ID: OAA.0007**)

In order to maintain Satisfactory Academic Progress, a student must maintain a 2.0 or better in each and every course. Any grade less than a C must be remedied by repeating the class. Please refer to Satisfactory Academic Progress (**Policy ID: OAA.0006**)

Attendance: Please refer to Attendance Policy (**Policy ID: OAA.0002**)

Conduct and Responsibilities: Please refer to the Personal Conduct, Responsibility and Academic Responsibility Policy (**Policy ID: OAA.0003**)

Make-up Exams: Please refer to Make-up Assessment Policy (**Policy ID: OAA.0001**)

Request for Special Testing: Please refer to Request for Special Testing (**Policy ID: OAA.0004**)

Accommodation for Students with Disabilities:

If you have approved accommodations, please make an appointment to meet with your instructor as soon as possible. If you believe you require an accommodation, but do not have an approved accommodation letter, please see the Academic Counselor Lori Pino in the Office of Academic Affairs. Contact info: Lpino@lifewest.edu or 510-780-4500 ext. 2061. Please refer to Service for Students with Disabilities Policy (**Policy ID: OAA.0005**)

Electronic Course Management:

Canvas is LCCW's Learning Management System (LMS). Canvas will be used throughout the quarter during this course. Lectures, reminders, and messages will be posted. In addition, documents such as the course syllabus and helpful information about the class project will be posted. Students are expected to check Canvas at least once a week in order to keep updated. The website address for Canvas is <https://lifewest.instructure.com/login/canvas> Please refer to the Educational Technologies Policy (**Policy ID: OAA.0009**)

EXTRA CREDIT:

There will be no extra credit work accepted in this class.

INDEPENDENT STUDENT WORK:

All assignments and exams must be the product of the individual student's original efforts for this class. Collaboration is prohibited unless explicitly allowed in the instructions of individual assignments.

COURSE GOALS:

The goal of the Biochemistry 1 course is to provide a detailed understanding and foundation of the relationship between structure, function and performance of biomolecules, biomaterials and the systems that employ them. A second goal is to provide a basic knowledge of the regulation of integrated metabolic pathways within cells and tissues for use in future biochemistry, metabolic disorders, nutrition, toxicology, endocrinology and pathophysiology courses.

LEARNING OBJECTIVES & WEEKLY SCHEDULE:

UNIT 1: Biochemical molecules and their physicochemical properties

Weeks 1 & 2: Chemical Structure and Behaviour: Carbohydrates, Amino Acids, Nucleotides and Fatty Acids, Neurotransmitters, Polysaccharides, Glycosaminoglycans (GAGs), Phospholipids and Cholesterol

Week 3 & 4: Buffers and Equilibrium: pKa, pH, Henderson-Hasselbalch Equation, blood and intracellular pH buffer systems, LeChatelier's Principle and acidosis. Titration curves of amino acids, pI, buffer regions of ionizable groups of amino acids

MIDTERM 1: Week 5 (covers Unit 1 material)

UNIT 2: Proteins, Synthesis and Metabolism, Hemeproteins, Fibrous Proteins

Weeks 5 & 6: Proteins: Structure, Synthesis, Degradation, Hemoglobin, Myoglobin, and Elastin and Collagen. Emphasis on genetic expression of traits and function of these proteins.

Week 7: Reaction Rate Kinetics-Enzymes and Cofactors: Arrhenius rate constants, Enzymes, Michaelis-Menten Kinetic Model, Cofactors, Catalysis, Coenzymes, Vitamin functions and deficiencies.

MIDTERM 2: Week 8 (covers Unit 2 material)

UNIT 3: Energy metabolism in the cell

Week 8: Reaction Rate Kinetics-Regulation: Signal transduction, secondary messengers, covalent modification, allosteric effectors, and synthesis and degradation of enzyme proteins.

Weeks 9 & 10: Cellular Metabolism: Regulation of metabolism within the cell, Energy balance within the cell, substrate availability, metabolic fuels. Examples will compare and contrast the differentiated roles of the liver and skeletal muscle in well-fed, transition into fasting and extended starvation states.

- GLYCOLYSIS (with signal transduction schemes of insulin and glucagon)
- Fates of PYRUVATE (regulation to form acetyl CoA, oxalaoacetate, alanine, lactate)
- TCA CYCLE, ETC, OXIDATIVE PHOSPHORYLATION (Integration and Energy Regulation)

FINAL: Week 11 (Comprehensive exam of Units 1, 2 and 3)

STUDENT LEARNING OUTCOMES:

Upon successful completion of Biochemistry 1 the student should be able to

1. Relate the structure of biochemical compounds to their physicochemical properties and their function within cells, tissues and physiologic systems. (PLO #3, 6, 8)
2. Apply chemical equilibria to chemically reacting systems, including the ionization behaviour of weak acids and bases responsible for the pH buffer systems of cells and the blood. (PLO #3, 6, 8)
3. Understand the structures, functions and integrated metabolism of proteins, including their synthesis, degradation, physiologic applications, and protein turnover. (PLO #3, 6, 8)
4. Apply the fundamental kinetic properties of enzymes to the regulation of the rates of catalyzed biochemical reactions. (PLO #3, 6, 8)
5. Integrate signal transduction schemes, substrate availability and cellular energy balance to the regulation of glycolysis, the metabolic fates of pyruvate and glucose-6-phosphate, and the Citric Acid Cycle, Electron Transport Chain and Oxidative Phosphorylation. (PLO #3, 6, 8)

Program Learning Outcomes (PLO): Students graduating with a Doctor of Chiropractic degree will be proficient in the following:

1. **ASSESSMENT AND DIAGNOSIS:** An assessment and diagnosis requires developed clinical reasoning skills. Clinical reasoning consists of data gathering and interpretation, hypothesis generation and testing, and critical evaluation of diagnostic strategies. It is a dynamic process that occurs before, during, and after the collection of data through history, physical examination, imaging, laboratory tests and case-related clinical services.
2. **MANAGEMENT PLAN:** Management involves the development, implementation and documentation of a patient care plan for positively impacting a patient's health and well-being, including specific therapeutic goals and prognoses. It may include case follow-up, referral, and/or collaborative care.
3. **HEALTH PROMOTION AND DISEASE PREVENTION:** Health promotion and disease prevention requires an understanding and application of epidemiological principles regarding the nature and identification of health issues in diverse populations and recognizes the impact of biological, chemical, behavioral, structural, psychosocial and environmental factors on general health.
4. **COMMUNICATION AND RECORD KEEPING:** Effective communication includes oral, written and nonverbal skills with appropriate sensitivity, clarity and control for a wide range of healthcare related activities, to include patient care, professional communication, health education, and record keeping and reporting.
5. **PROFESSIONAL ETHICS AND JURISPRUDENCE:** Professionals comply with the law and exhibit ethical behavior.
6. **INFORMATION AND TECHNOLOGY LITERACY:** Information literacy is a set of abilities, including the

use of technology, to locate, evaluate and integrate research and other types of evidence to manage patient care.

7. **CHIROPRACTIC ADJUSTMENT/MANIPULATION:** Doctors of chiropractic employ the adjustment/manipulation to address joint and neurophysiologic dysfunction. The adjustment/manipulation is a precise procedure requiring the discrimination and identification of dysfunction, interpretation and application of clinical knowledge; and, the use of cognitive and psychomotor skills.
8. **INTERPROFESSIONAL EDUCATION:** Students have the knowledge, skills and values necessary to function as part of an inter-professional team to provide patient-centered collaborative care. Inter-professional teamwork may be demonstrated in didactic, clinical or simulated learning environments.
9. **BUSINESS:** Assessing personal skills and attributes, developing leadership skills, leveraging talents and strengths that provide an achievable expectation for graduate success. Adopting a systems-based approach to business operations. Networking with practitioners in associated fields with chiropractic, alternative medicine and allopathic medicine. Experiencing and acquiring the hard business skills required to open and operate an on-going business concern. Participating in practical, real time events that promote business building and quantifiable marketing research outcomes
10. **PHILOSOPHY:** Demonstrates an ability to incorporate a philosophically based Chiropractic paradigm in approach to patient care. Demonstrates an understanding of both traditional and contemporary Chiropractic philosophic concepts and principles. Demonstrates an understanding of the concepts of philosophy, science, and art in chiropractic principles and their importance to chiropractic practice.