

SYLLABUS

Name of Course: Biochemistry 2, CHEM 133

Length of Course: 3.5 units; 55 hours (5 hrs lecture per week)

Course Description: Biochemistry 2 studies the metabolism and regulation of the well-fed, fasting and starvation states with an emphasis on integrated metabolism and signal transduction schemes.

Prerequisites: CHEM-121

Course Offered by: Basic Sciences Department

Required Texts:

1. Harvey and Ferrier, Biochemistry: Lippincott's Illustrated Reviews; 6th ed., 2014.
2. Liebermann, Marks and Peet, Mark's Basic Medical Biochemistry: A Clinical Approach, 4th ed., 2013.

Recommended Texts:

1. Murray, et al., Harper's Illustrated Biochemistry. 29th ed., 2012.
2. McKee and McKee, Biochemistry: The Molecular Basis of Life; 5th ed., 2014.
3. Meisenberg and Williams, Principles of Medical Biochemistry; 2nd ed., 2006.
4. Baynes, Medical Biochemistry; 3rd ed., 2012.
5. Mahon, Escott-Stump and Raymond, Krause's Food and Nutrition Care Process, 13th ed., 2012.

Reference Texts:

1. Voet, Voet and Pratt, Fundamentals of Biochemistry, 4th ed., 2013.
2. Lehninger and Nelson, Principles of Biochemistry; 6th ed., 2013.

Materials: Handouts and grades will be posted on the CANVAS website learning environment. (Access through the e-Learning environment located via the link for Current Student on the LCCW homepage).

Method of Instruction: PowerPoint/Keynote lectures, in-class assignments, small group activities, discussion, in-class critique and exams

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**)

Evaluation and Grading:

Grades will be based on four quizzes and one exam and an in-class assignment.

Quiz #1	10%
Quiz #2	10%
Quiz #3	10%
Quiz #4	10%

Final exam 20%
In-class assignment 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.

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 2 course is to understand the integrated metabolism of the human body in the well-fed state, the transition into fasting, and in an extended starvation state. The course requires understanding the reaction chemistries of individual metabolic pathways and how the activities of these pathways are integrated and regulated by neurotransmitters and hormones.

The second goal is to apply the knowledge and understanding of integrated metabolism to the ability of the human body to adapt and respond to its environment and maintain health.

LEARNING OBJECTIVES & WEEKLY SCHEDULE

Weeks 1-2: Review of Primary Carbohydrate Metabolism Carbohydrate Digestion & Absorption (Ch. 7) Glycolysis (Ch. 8); TCA Cycle (Ch. 9); ETC & Oxidative Phosphorylation (Ch. 6) Metabolism of Monosaccharides and Disaccharides (Ch. 12)
Week 2: Quiz #1—Carbohydrate Digestion & Absorption, Glycolysis, TCA, and ETC/OP
Weeks 3-4: Primary Carbohydrate Metabolism and Glycogen Metabolism Gluconeogenesis (Ch. 10) Glycogenesis/Glycogenolysis (Ch. 11)

Pentose Phosphate Pathway (Ch. 13)
Reactive Oxygen Species (ROS)

Week 4:

Quiz #2—Other Carbohydrates, Gluconeogenesis, Signal Transduction and Glycogen Metabolism

Weeks 5-6: Lipid Metabolism

de novo Fatty Acid Synthesis, Lipogenesis and Fat Storage (Ch. 16, pp. 181-189)
Dietary Lipid Metabolism (Ch. 15)
Lipolysis and β -Oxidation of Fatty Acids (Ch. 16, pp. 189-195)
Metabolism of Ketone Bodies (Ch. 16, pp. 189-197)
Lipoprotein Transport (Ch. 18, pp. 227-237),
Cholesterol and Steroid Metabolism (Ch. 18, pp. 219-227)

Week 6:

Quiz #3—Pentose Phosphate, ROS, Fatty Acid Biosynthesis, Dietary Lipid Metabolism, β -oxidation, and Ketone Bodies

Weeks 7-8: Nitrogen Metabolism

Protein Digestion and Absorption (Ch 19, pp 245-250)
Protein Catabolism and Amino Acid Degradation (Chs 19 & 20)
The Amino Acid Pool, Protein Turnover, Nitrogen Disposal (Ch. 19)
Urea Cycle (Ch 19)
Amino Acid Biosynthesis (Ch. 20)

Week 8:

Quiz #4—Cholesterol Metabolism, Lipoprotein Transport, Protein Digestion, Nitrogen Disposal, Urea Cycle, Amino Acid Catabolism

Weeks 9-10: Integrated Metabolism and Diabetes Mellitus

Glucagon and Insulin Signaling in Early Fasting (Ch. 23)
Introduction to Integrated Metabolism—Glucose Homeostasis, Role of the Liver, Muscle, Adipose and Nervous System, Well-fed state, transition to fasting and the Starvation State
Fast Cycles (Ch. 24)
IDDM (Type I) and Insulin-resistant DM (Type II)
Hormones – Structure and function
In-class Assignment Due Week 10

Week 11: Final Exam

50% Amino Acid Biosynthesis, Insulin & Glucagon Signaling, Integrated Metabolism
50% Comprehensive

Student Learning Outcomes:**This course aligns to PLOs: (3)**

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

1. Integrate the biochemical pathways of the well-fed state and explain how the signal transduction systems initiated by a high insulin-to-glucagon ratio regulate these pathways.
2. Integrate the biochemical pathways of the transition into an early fasting state and explain how the signal transduction systems initiated by a moderate-to-low insulin-to-glucagon ratio regulate these pathways.
3. Integrate the biochemical pathways of starvation and metabolically stressed states and explain how these pathways are regulated by the signal transduction system of a sympathetic (“fight-or-flight”) response combined with the action of cortisol on the regulation of protein biosynthesis and genomic expression of traits.
4. Relate metabolic diseases and conditions to the deficiencies of enzymes, proteins and coenzymes arising from either nutritional deficiencies, autoimmune diseases or defects in inherited genetic traits.

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.