CHEM C281: BIOCHEMISTRY

Item	Value
Curriculum Committee Approval Date	09/14/2018
Top Code	049900 - Other Biological Sciences
Units	4 Total Units
Hours	72 Total Hours (Lecture Hours 72)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	No
Basic Skills	Not Basic Skills (N)
Repeatable	No
Open Entry/Open Exit	No
Grading Policy	Standard Letter (S)
Local General Education (GE)	• Area 5B Life Sciences (CB2)
California State University General Education Breadth (CSU GE-Breadth)	• CSU B2 Life Science (B2)

Course Description

An introduction to the chemistry of biology with a focus on the structure and function of biomolecules, metabolic processes, and hormonal regulation. This course serves to satisfy transfer requirements for some biology majors. Enrollment Limitation: BIOL C281; students who complete CHEM C281 may not enroll in or receive credit for BIOL C281. PREREQUISITE: CHEM C220. ADVISORY: BIOL C180. Transfer Credit: CSU; UC.

Course Level Student Learning Outcome(s)

1. Describe the fundamental chemical principles and reactions involved in biochemical processes and explain the structure, function, and regulation of metabolic pathways.
2. Read, evaluate, cite, and explain biochemistry-related developments published in peer-reviewed journals.
3. Apply knowledge of bioenergetics and metabolic pathways to solve biological problems.

Course Objectives

- 1. Give a general description of a cell, emphasizing the chemical composition of cellular components.
- 2. Describe the major distinguishing structural features of proteins, emphasizing their primary, secondary, tertiary, and quaternary structure.
- 3. Describe the relationship between structure and function of a few representative biomolecules.
- 4. Diagram mechanisms of action for the catalysis of reactions by specific enzymes.
- 5. Describe various models of enzyme inhibition.
- 6. Explain the main reactions of carbohydrate biosynthesis and degradation and describe their regulation.
- 7. Describe how catabolic and anabolic pathways of carbohydrates, proteins, and lipids are integrated.
- 8. Use web-based resources to perform literature searches.
- 9. Describe how various hormone signaling pathways are integrated within a cell.
- 10. Compare and contrast the processes of ribonucleic acid (RNA) transcription and protein translation.
- 11. Provide basic details on the mechanisms that dictate gene expression in both prokaryotic and eukaryotic cells.

Lecture Content

Water and Weak Interactions Protein Structure and Function Amino acid structure Levels of protein structure Myoglobin and hemoglobin Enzymes Enzyme kinetics Control of enzyme activity Carbohydrate Structure and Function Lipid Structure and Function Biological membranes and transport Nucleic Acid Structure and Function Transcription Translation Gene regulation Cellular Metabolism Protein metabolism Carbohydrate metabolism Glycolysis and Gluconeogenesis Citric Acid (Krebs) Cycle Pentose Phosphate Pathway Fatty acid metabolism Metabolic pathway regulation Amino Acid Degradation Urea Cycle Oxidative Phosphorylation Photosynthesis Biosignaling Pathways Hormonal regulation

Method(s) of Instruction

- Lecture (02)
- DE Live Online Lecture (02S)
- DE Online Lecture (02X)

Instructional Techniques

This course is presented through lecture material supplemented with visual materials, such as PowerPoint slides. Course materials will also be provided to the students in the learning management system. In addition, lectures may incorporate case studies, small-group discussions, and active-learning techniques to engage students. Students will read and evaluate scientific research articles, carry out small-group discussions, and give oral presentations.

Reading Assignments

Readings from text Reading biochemistry-related articles from scientific journals

Writing Assignments

Evaluation of biochemistry-related articles Report on biochemistry-related human disease

Out-of-class Assignments

Online quizzes Oral Journal Article presentation Homework Problems

Demonstration of Critical Thinking

Critical evaluation of a journal article given in an oral presentation

Required Writing, Problem Solving, Skills Demonstration

Biochemistry-related disease writing assignment Quizzes and Exams are primarily composed of biochemistry problems.

Eligible Disciplines

Biological sciences: Master's degree in any biological science OR bachelor's degree in any biological science AND master's degree in biochemistry, biophysics, or marine science OR the equivalent. Master's degree required. Chemistry: Master's degree in chemistry OR bachelor's degree in chemistry or biochemistry AND master's degree in biochemistry,

chemical engineering, chemical physics, physics, molecular biology, or geochemistry OR the equivalent. Master's degree required.

Textbooks Resources

1. Required Berg, J. M.; Tymoczko, J.; and Stryer, L. Biochemistry, 9th ed. New York: W. H. Freeman, 2019 2. Required Nelson, D. L.; Cox, M. M. Lehninger Principles of Biochemistry, 7th ed. New York: W. H. Freeman, 2017 Rationale: - Legacy Textbook Transfer Data: Legacy text 3. Required Tymoczko, J.; Berg, J. M.; Stryer, L. Biochemistry: A Short Course, 4th ed. New York: W. H. Freeman, 2018

Other Resources

1. Coastline Library