Minnesota State University Moorhead

CHEM 400: Biochemistry I

A. COURSE DESCRIPTION

Credits: 3

Lecture Hours/Week: 3

Lab Hours/Week: 0

OJT Hours/Week: *.*

Prerequisites:
CHEM 350 - Organic Chemistry I

Corequisites: None

MnTC Goals: None

A survey of the chemistry and metabolism of living systems. Topics include buffers and biological buffering, structure, function and chemistry of proteins, carbohydrates, lipids, nucleic acids and enzymes, and introduction to metabolism and metabolic pathways.

B. COURSE EFFECTIVE DATES: 06/01/1995 - Present

C. OUTLINE OF MAJOR CONTENT AREAS

1. Prokaryotic and eukaryotic cell differences and the biochemistry taking place in the compartments of each type of cell
2. Water chemistry and interactions between biological molecules with water and each other
3. Buffers and biological buffering
4. Components of and structures and functions of the major classes of biomolecules, proteins, carbohydrates, lipids and nucleic acids
5. Basics of protein purification and handing based on the chemical properties of proteins
6. Mechanisms, kinetics and regulation of enzymes
7. Properties of Anabolic and Catabolic Metabolism
8. Thermodynamics in Biological Systems
9. Overall functions and steps of the central catabolic pathways including glycolysis, citric acid cycle and electron transport coupled to oxidative phosphorylation

D. LEARNING OUTCOMES (General)

1. Analyze the three dimensional interactions of biological molecules that stabilize biomolecule function.
2. Compare the structures and functions of biomolecules and relate the functions to the structural organizations of biomolecules.
3. Demonstrate understanding of buffers and biological buffering in biological buffering by completing buffer calculations and identifying the sources of buffers in living systems.
4. Demonstrate understanding of the acid/base properties of functional groups in biological molecules by calculation and description.
5. Describe the composition and structure of biological membranes.
6. Describe the primary, secondary, tertiary and quaternary structure of proteins and the chemical interactions that stabilize and disrupt levels of protein structure.
7. Describe the properties of water, interactions between biological molecules and water and the importance of water to the biochemistry of living systems.
8. Discuss and analyze the mechanisms and kinetics of enzymes and calculate kinetic constants using common methods employed in enzyme analysis.
9. Discuss and note the overall functions of central catabolic pathways including glycolysis, citric acid cycle and electron transport and oxidative phosphorylation.
10. Explain the similarities and differences between catabolic and anabolic metabolic pathways based on overall function, types of coenzymes employed, and thermodynamics.
11. Identify the amino acid building blocks of proteins and describe the chemistry of peptide bond formation.
12. Identify the biological and compartmentation differences between prokaryotic and eukaryotic cells and describe where the central metabolic pathways take place in each type of cell.
13. List and define the types of regulation of enzymes.
14. Recognize and describe the structures and functions of fatty acids and lipids.
15. Recognize and describe the structures and functions of monosaccharides, monosaccharide derivatives, oligosaccharides and polysaccharides.
16. Recognize and describe the structures and functions of nucleotides and nucleic acids.
17. Recognize enzyme classes and the common catalytic mechanisms employed by biological catalysts.
18. Recognize how the application of thermodynamics to biological systems can predict the direction of reactions involved in metabolic pathways.
19. Recognize the basic steps and procedures in protein purification and analysis and predict how proteins will separate by chromatographic and electrophoresis procedures based on their chemical makeup.

E. Minnesota Transfer Curriculum Goal Area(s) and Competencies

None

F. LEARNER OUTCOMES ASSESSMENT

As noted on course syllabus

G. SPECIAL INFORMATION

None noted