Minnesota State University Moorhead

CHEM 410: Biochemistry II

A. COURSE DESCRIPTION

Credits: 3

Lecture Hours/Week: 3

Lab Hours/Week: 0

OJT Hours/Week: *.*

Prerequisites:
This course requires any of these three prerequisites
CHEM 400 - Biochemistry I
BCBT 400 - Biochemistry I
BIOL 400 - Biochemistry I

Corequisites: None

MnTC Goals: None

A survey of the chemistry and metabolism of living systems and nucleic acids biochemistry. Topics include study of catabolic and biosynthetic biochemical pathways and their regulation, chemical messengers and signal transduction, integration of metabolic pathways and nucleic acids biochemistry and other advanced biochemistry topics.

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

C. OUTLINE OF MAJOR CONTENT AREAS

1. Bioenergetics as applied to biochemical systems
2. Methods of studying catabolic and anabolic pathways
3. Nitrogen metabolism pathways
4. Chemical messengers and signal transduction
5. Integration of metabolic pathways
6. Nucleic acids biochemistry
7. Advanced topics in biochemistry which may include advanced nucleic acids biochemistry, cancer biology and other modern topics in nucleic acids biochemistry

D. LEARNING OUTCOMES (General)

1. Describe prokaryotic and eukaryotic gene expression and regulation.
2. Describe the genetic code and protein synthesis and posttranslational processing.
3. Describe the steps and regulation of the pathways of carbohydrate, lipid and protein anabolism, starting from the building blocks. This should include the reactants and products, enzymes, cofactors and coenzymes, identification of most highly regulated steps and the resulting of the steps of these pathways and the logic for the regulation. Such pathways include gluconeogenesis, glycogenesis, and basics of glycoprotein and other carbohydrate metabolism.
4. Describe the steps and regulation of the pathways of carbohydrate, lipid and protein catabolism, starting from ingestion and continuing through metabolism including all reactants and products, enzymes, cofactors and coenzymes.
5. Describe the structure of DNA and the steps in replication and repair and recombination.
6. Describe the structure of RNA and transcription and RNA processing.
7. Determine direction of reactions of metabolic pathways based on bioenergetics calculations.
8. Discuss the regulation of metabolic pathways via regulation of the enzyme catalyzed reactions of these pathways.
9. Discuss the steps in the synthesis and degradation of the building blocks of nucleic acids, the nucleotides.
10. Explain and give examples of the relationships among diseases and metabolism and genetics.
11. Explain the Integration of metabolic pathways and coordinated regulation of metabolic pathways.
12. Explain the steps and mechanisms in biochemical signaling, including hormones, receptors, G proteins, second messengers, and the steps from hormone to metabolic effects for the major signaling pathways.
13. Identify the most highly regulated steps and the regulation of the steps of these pathways and the logic for the regulation. Such pathways include glycolysis, glycogenolysis, lipid beta oxidation, amino acid breakdown and the urea cycle and breakdown of nitrogenous compounds.
14. Identify the relationships among metabolic pathways and the functions of cells, tissues and organs in living systems.
15. Recognize the differences between catabolic and anabolic pathways and the metabolic flux and big picture effect/biochemical logic for effects on these classes of metabolic pathways.
16. Recognize the importance of thermodynamics in determining the direction and regulatory capabilities of metabolic pathways and experimental approaches to the study of metabolism.

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

None

F. LEARNER OUTCOMES ASSESSMENT

As noted on course syllabus

G. SPECIAL INFORMATION

None noted