

## COURSE OUTLINE Biochemistry (Chem 447)

**DEPARTMENT:** Biology, Chemistry & Environmental Health Science  
**COURSE NO:** Chem 447  
**CREDIT HOURS:** 4  
**INSTRUCTOR:** Dr. B Fraij  
**OFFICE LOCATION:** Alumni Hall 104  
**Email address:** fraijb@benedict.edu  
**OFFICE PHONE:** 803-705-4445  
**LECTURE TIME & PLACE:** MWF 3: 00-3:50 AM, AH 105  
**LABORATORY TIME & PLACE:** T: 9.00 AM-NOON, AH 316  
**OFFICE HOURS:** MWF 11:00-12:00 AM & TH 11:00-12:00, 1:00-3:30 PM

**REQUIRED TEXTBOOK:** Concepts in Biochemistry, Rodney Boyer, 3 third Edition

**Class Attendance:** Class attendance is taken on a daily basis. Students are expected to attend all classes. The official college attendance policy is followed.

Attendance in each class is counted from the first day the student is eligible to attend the class as given on the student's assessment sheet "admit to class" registration card or student change notice. Student may obtain an excuse for the emergency absence from the Dean of Students upon presentation of satisfactory documentation. Student is required to present the excused absence to me within one week after he/she returns to class.

**EVALUATION:** Approximately 4 unit examinations and quizzes will be given during the course. Each exam will consist of both multiple choice and discussion questions. Any student who misses a scheduled exam without a valid excuse will receive a grade of "0" with no opportunity to make up the exam. Students who miss an exam because of a valid reason, such as sickness or family emergency, must make up the exam within one week after returning to school. Failure to do so will result in a grade of "0". The make-up exam will not consist of the same questions used in the missed exam. **It is the responsibility of the student, not the instructor, to schedule the make-up exam.**

The semester grade is based on the average score of two lecture exams, quizzes, the final exam and lab reports. The letter grade is based on percentage as follows: A: 90-100; B: 80-89; C: 70-79; D: 60-69 and F: 59 and below. Points are not awarded for class attendance. Excessive absences may affect the final grade (see below). There are no extra credit assignments in this course.

**The grading scores are given below:**

<b>Examinations and quizzes</b>	<b>250 pts</b>
<b>Laboratory and reports</b>	<b>100 pts</b>
<b>Final exam</b>	<b>150 pts</b>

**COURSE DESCRIPTION:** The course is a study of the theory and practice of biochemistry. As an introductory biochemistry course, the major areas of biochemistry will be covered for undergraduates interested in the field of biochemistry.

**OBJECTIVES:** Upon completion of this course, students will be able to demonstrate the following competencies:

1. Understand the medium of life, molecular structure of water

2. Describe the buffer selection
3. Describe amino acids and proteins
4. Describe the molecular structure of proteins
5. Understand functional diversity of proteins, myoglobin and hemoglobin
6. Outline a general scheme for protein purification and explain techniques
7. Understand enzyme catalysis and inhibition
8. Define the most abundant biomolecules on earth, carbohydrates
9. Discuss the carbohydrate metabolism
10. Explain different types of metabolic pathways and ATP formation
11. Understand lipids
12. Discuss lipid metabolism
13. Explain DNA and RNA structure
14. Understand DNA replication

## MAIN TOPICS

- I. Introduction to molecular structure of water
  - a. Water is a polar molecule
  - b. Solvent properties of water
  - c. Ionization of water, acids and bases
  - d. Buffer selection, Henderson-Hasselbalk equation
- II. Amino acids and peptides
  - a. The building blocks of proteins
  - b. Physiological interest of amino acids
  - c. Amino acids and proteins as acids and bases/ solving problems
  - d. Protein structure
  - e. Protein sequencing
  - f. Protein purifications
  - g. Analytical methods and techniques
  - h. Enzyme kinetics
  - i. Enzyme inhibition
- III. Carbohydrates
  - a. Aldoses, ketoses, formation of hemiacetals
  - b. Disaccharides, homopolysaccharides, heteropolysaccharides
  - c. Glycolysis
  - d. Gluconeogenesis, pentose phosphate pathway
  - e. Aerobic metabolism
  - f. Oxidative phosphorylation
  - g. Antioxidant systems
- IV. lipids
  - a. Fatty acids, triglycerides, neutral fats
  - b. Phospholipids and cell membrane
  - c. Sterols
  - d. Lipid metabolism
  - e. Health effect of lipids
- V. Nucleic acids
  - a. DNA and RNA structures
  - b. Gene expression
  - c. Polymerases