Fall 2013

Chemistry 314

BIOORGANIC CHEMISTRY

Dan. Libby 213 Collier Ext. 1436 E-mail: rdlibby@cs.moravian.edu	Class Hours TR 10:20 -11:30 AM Room 107 Collier	Office Hours Mon. 10:00 AM -> 11:00 AM Wed. 11:00 PM -> 12:00 PM Thurs. 9:00 AM -> 10:00 AM Fri. 10:00 AM -> 11:00 AM Or any time, just call X1436

COURSE OUTLINE:

I. Enzymes as Catalysts: What do they do?
   A. Rate Acceleration
   B. Reaction Specificity

II. Enzymes as Proteins: What do they look like?
   A. Amino Acids
   B. Protein Structure:
      1. Primary Sequence
      2. Secondary Structural Features
      3. Tertiary Structure
      4 Quaternary Structure

III. Mechanisms of Enzyme Catalysis: What tools do they have and how do we know about them?
   A. Proximity Effects
   B. General Acid-Base Catalysis
   C. Covalent Catalysis
   D. Metal Ion Effects
   E. Coenzymes in Enzyme Catalyzed Reactions

IV. A Mechanistic Look at Enzymes in Metabolic Pathways: What can they accomplish?
   A Glycolysis
   B. Tricarboxylic Acid Cycle

V. Approaches to Studying Enzyme Catalyzed Reactions: How do we learn about them?
   A. Isotope Tracers
   B. Detection or Isolation of Intermediates
   C. Kinetic Studies
      1. Steady-State Kinetics
      2. Inhibitor Studies
      3. Site Specific Mutagenesis
      4. Kinetic Isotope Effects

VI. Chemical Models for Enzymes: What can we learn about and from enzymes?

A. Nicotinamide Coenzyme Models

B Heme Enzyme Models

VII. Chloroperoxidase: Undergraduate research on an enzyme catalyzed reaction.

TEXT: none

REFERENCE: Internet sites, Organic Class Notes and Any Introductory Organic Text.

COURSE GOALS:

CHEM 314 is an upper-level chemistry course that focuses on the applications of chemistry to biological systems (living organisms). Since the academic area termed bioorganic chemistry is very broad, it involves many more topics than could be reasonably considered in one semester. Thus this course will focus primarily on protein structure and functions of catalytic proteins, enzymology. Enzymology is my particular area of interest. After we have developed our understanding of the fundamentals of enzymology, we will spend a few classes considering some of the results of my undergraduate research program over the last 30 years. Hopefully, your experience in this course will give you some appreciation of how enzymes can take advantage of fundamental physical and chemical interactions to catalyze the specific organic reactions necessary to maintain life in organisms.

Approximate Schedule of Events

Mid-term Take-home Exam	October 22 -> 29
Final Exam - Take-home	Due by 5:00 PM on December 10 (The day the final is scheduled by the registrar)

EVALUATION:

Mid-term Take-Home Exam	25 %
Research assignments	25 %
Class Participation & Group Assignments	25 %
Final Exam	25 %

STUDY GROUPS:

Class Organization and Daily Assignments: To promote preparation for class and discussion in class, you have each been assigned to a study group. In general each new topic or concept that you encounter in this class will be presented to your group as an in-class activity, however, many of the activities will require that you work as a group to find information (See Research Assignments below) and devise what you believe to be reasonable responses, interpretations or other analyses before coming to class. These group analyses will then be shared with the class and we will work together to settle differences and come to a consensus on how best to deal with the material. The course structure encourages you to take responsibility for and an active part in your education.

Group Composition and Dynamics: Groups will be organized similarly to the way most of you experience in Chem 211-212.

Collaboration and Academic Honesty:

Collaboration among students in class and in preparation for class discussion is generally encouraged and required for most classes. Educational research indicates that students learn best when they engage in discussions and analyses of class material with their peers. Some of your assignments will be group projects and will require collaboration; however, the final versions of individual written exams submitted for evaluation must be prepared without consultation with other students. To be fair to all students in the course and to assure maximum learning for each student, we follow all the guidelines for academic honesty spelled out in the *Moravian College Student Handbook*
(See College Website http://www.moravian.edu/studentLife/handbook/academic/academic2.html).

Research Assignments:

Since we will not use a reference text, it will be necessary to find background information to support in-class activities. There are many Internet sites on biochemical topics, so most of the Research Assignments will involve finding information from the Internet. Before or after most in-class activities there will be Research Assignments to provide material for the activity or as applications of the concepts developed. Some of the Research Assignments will include finding, downloading and using some specific molecular modeling software packages that allow you to explore biomolecular structures. Your grade on these assignments will be based upon materials you post on the course Blackboard site. The projects will account for 25% of your course grade.

CH 314 Fall Term Calendar

August 2013

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
25	26 Classes Begin	27	28	29	30	31

September 2013

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

October 2013

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	1	2	3	4	5
6	7	8	9	10	11	12 Fall Break
13 Fall Break	14 Fall Break	15 Fall Break	16	17	18	19
20	21	22 Mid-term provided	23	24	25	26
27	28	29 Mid-term Due	30	31		

November 2013

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23 **Thanksgiving Break**
25 **Thanksgiving Break**	25 **Thanksgiving Break**	26 **Thanksgiving Break** Lib	27 **Thanksgiving Break**	28 **Thanksgiving Break**	29 **Thanksgiving Break**	30 **Thanksgiving Break**

December 2013

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1 **Thanksgiving Break**	2	3	4	5	6 Classes End **Final Provided**	7 **Reading Day**
9 **Reading Day**	10 Final Exams	11 Final Exams	12 Final Exams	13 Final Exams	14 Final Exams **CHEM 314 FINAL Due 5:00PM**	15 Final Exams

***Group Role Definitions*:**

Manager

Manages the group. Insures that the group has the **appropriate materials** (class and lab textbooks, lab manual, molecular models, etc.), that **members are fulfilling their roles**, that the **assigned tasks are being accomplished on time**, and that **all members** of the group **participate** in the activities and **understand the concepts**. The Manager **communicates with the instructor** when information or assistance is required and is responsible for seeing that group reports and **quizzes are submitted in a timely manner**.

Recorder

Obtains the **group folder** and **records the names and roles** of the group members at the beginning of each day. **Records group answers and explanations**, along with **questions** the group has in dealing with the material. **Submits the group records** to the instructor with the group folder at the end of each class period. The Recorder's answers will be considered to be the official group response to each day's activities.

Presenter

Presents group conclusions to the class when requested by the instructor. These presentations may be oral or written on the blackboard, and will be the bases for whole class discussions. The Presenter is also the one who **shares information with other groups** when it is deemed appropriate.

Reflector

Observes and comments to the manager **on group dynamics and behavior** with respect to the learning process, and **the effectiveness of the group** in dealing with daily assignments. The Reflector may be called upon to report to the group or the entire class concerning how well the group is operating or what needs improvement and why.

Technician

Performs technical duties such as model building, calculations, looking up information in the reference books, Internet, etc.

NOTE: In groups of four people, one student will fill both the Reflector and Technician roles.

Disability Support Services
Students who wish to request accommodations in this class for a disability should contact Elaine
Mara, assistant director of learning services for academic and disability support at 1307 Main
Street, or by calling 610-861-1510. Accommodations cannot be provided until authorization is
received from the Academic Support Center. Students with other needs/ concerns are encouraged
to make an appointment with Dr. Ronald Kline in the Counseling Center (all other disabilities).
The Counseling Center is located at 1307 Main Street (610) 861-1510. Please refer to the
Moravian College Student Handbook under Academic Resources for more information.