

SYLLABUS
CHEM-406 Biochemistry II
Dr. Jeff Osborne

COURSE OBJECTIVE

This course aims to familiarize you with the fundamentals of the structure, function, and interaction of nucleic acids; important aspects of molecular physiology; and metabolic pathways in order to prepare you for further professional study.

OFFICE HOURS

My office is room 313 Science Center. Office hours are posted outside my office and I will be regularly available at other times, as well, if I am not busy. My email is jposborne@manchester.edu. I will try to respond to your questions and course related difficulties within 24 hours, either by email or by addressing them in class.

TEACHING METHODS

Class sessions mostly will be mostly either PowerPoint lectures or you working through process-oriented, guided inquiry activities in teams of three or four. These activities will efficiently facilitate the best learning, with you:

- **engaged** and **thinking** actively during class time.
- **drawing** conclusions from analyzing data, models, or examples and from discussing ideas.
- **working** together in self-managed teams to understand concepts and to solve problems.
- **reflecting** on what you have learned and on how to improve your performance.
- **interacting** with the me, as I facilitate learning.

A main project outside of class will be the biodegradation pathway assignment. I believe that a variety of teaching methods that challenge you to actively learn in a variety of ways, interact socially, cooperate with peers, and think independently will best achieve the Course Objective described above. Additional readings and online activities from various other informative web sites will be assigned as the class progresses.

I will create stimulating opportunities for your learning in a number of ways, providing and requiring many forms of feedback daily. I bring expertise in the subject area, yet require you to wrestle with the ideas presented so that you are able to arrive ultimately at your own conclusions. I enthusiastically welcome ideas and suggestions, with the goal of improving the course. I strive to practice what I preach as a scientist who is continually learning.

EXPECTATIONS OF STUDENTS

Students of biochemistry need to learn to examine and process information, devise relevant questions, and construct their own understanding of diverse topics. The content of the course will be presented during the lecture time and you will be responsible for everything that is presented during that time, unless it is explicitly excluded. Although in-class activities are done in teams, testing is individual. The National Association of Colleges and Employers Job Outlook 2008 report notes that employers rate Communication Skills, Strong Work Ethic and Teamwork Skills as the three most important qualities/skills in job candidates. You must engage yourself with your classmates in this class and then you will improve in these three areas. The textbook is a resource, but does not determine nor contain the full content of the course, as biochemistry is one of the most rapidly changing fields of science. You are expected to complete reading assignments *prior* to their corresponding lecture. You are expected to master specific skills for each exam. Missed quizzes, presentations, or exams cannot be made up except under very special, documented conditions described below under the heading "Makeup Tests" in Course Policies.

A process-oriented, guided-inquiry activity involves four components:

1. **Pre-Activity.** To be completed before class after or as you read the textbook chapter assignment.

2. **Model and/or Information.** The Model can be a figure, an equation, a table, prose, or any combination of the above. The Model is designed to define or develop some chemical concept. In some cases, Information is presented as background or elaboration for a Model.
3. **Critical Thinking Questions (CTQs).** Answers to CTQs reveal fundamental relationships or concepts inherent in the model, or elicit interpretation of the information. The questions are crafted such that one is led to make inferences and conclusions. These CTQs will be done as homework or in class.
4. **Skill Exercises and Problems.** Exercises are designed to give you practice in problem solving using the chemical concept(s) discovered in the Model. Problems are usually more difficult than Exercises and require application of several concepts. Both Exercises and Problems will generally be assigned as homework and not done in class.

WHAT STUDENTS CAN EXPECT FROM THE TEACHER

I will create opportunities for your learning in a number of ways and then provide constructive criticism in a welcoming and respectful environment. I bring enthusiasm and expertise in the subject area, yet require you to understand and wrestle with the ideas presented so that you are able to arrive ultimately at your own conclusions. I welcome ideas and suggestions, with the goal of improving the course. Toward this end, your feedback will be requested a number of times during the course. I strive to practice what I preach as a scientist who is continually learning.

CLASS WEBSITE

The class web site on Canvas will be updated frequently, and will include your daily readings and exercises to be completed outside of class.

REQUIRED MATERIALS

Biochemistry is changing much more rapidly than other parts of chemistry, so current textbooks are essential. The following two textbooks are required:

Biochemistry, 8th edition, by Berg, Tymoczko, Gatto, and Stryer (2015), ISBN: 9781464126109

Biochemistry, 4th edition, by Loertscher, Minderhout, and Frato, ISBN: 9781602635326.

You need a non-programmable calculator for exams and quizzes.

COURSE POLICIES:

Class Participation. All students are expected to participate in class exercises. I can help you learn, but the responsibility is yours.

Makeup Tests. Makeup tests and quizzes will only be given for students who missed them due to verifiable illness, religious holiday, serious family emergency, jury duty or court subpoena. Missing an exam or quiz without an excuse from the college nurse, a doctor, or Student Development is not permitted.

Academic Dishonesty. Cheating and plagiarism in the form of taking credit for someone else's work, thoughts, or conclusions without giving that individual proper credit will not be tolerated. Some other examples of cheating include using notes or looking at a classmate's paper during a quiz or exam, copying portions of someone else's work in your enzyme paper, or using the published ideas of another person without assigning credit to them by using a reference. For more specific information concerning the consequences of cheating and plagiarism, read the college catalog on "Plagiarism" and "Academic Dishonesty." Also, the "Academic Dishonesty and Grievance" document on Canvas has more details.

Diversity. To maintain a welcoming and respectful classroom environment, disrespect of other students, in the form of verbal or written threats, attacks, or insults on the basis of gender, race, physical disability, physical stature, culture, socio-economic class, creed, sexual preference, mental disability or any form of social group membership will not be tolerated.

Student Disability and Reasonable Accommodation Statement. Manchester University, in compliance with federal guidelines, is committed to assuring students with disabilities equal access to programs and activities that are provided to students without disabilities.

Any student who feels she or he may need an accommodation based on the impact of a disability should contact Audrey Hampshire, the Director of Academic Support and Disability Services, to establish eligibility and to coordinate reasonable accommodations. It is the student's responsibility to self-disclose the disability. Students whose accommodation requests are approved will be provided with confidential letters to deliver to their professors which verify the nature of the student's disability and document the need for auxiliary aids and services and/or academic adjustments/accommodations. Students are encouraged to meet with each professor early in the semester to discuss the academic implications of the disability as they relate to the specific course and to request appropriate accommodations. The Disability Support Services Office is located in the Success Center (second floor of the Switzer Center). Students may call (260) 982-5036 or (260) 982-5888 to schedule an appointment.

Medical Emergency Evacuation Schedule. Students should speak to the instructor immediately if (1) they may require medical attention during class, or (2) they have a disability, chronic condition, or a temporary injury that may limit or affect their ability to evacuate the classroom/building in an emergency. The student and the instructor should discuss the student's specific needs and the types of precautions that should be made in advance of such an event. In the event of a fire or other situation requiring emergency evacuation, students with ambulatory disabilities are to go with or without assistance to the nearest stairwell area. Faculty and staff will assist with evacuation management efforts until such time as the Campus Safety and/or Police and Fire Departments arrive on the scene to assist in student evacuation from the building. Elevators are not to be used for evacuation by any persons.

Students who need special arrangements in the event of an evacuation should also register with Audrey Hampshire as early as possible in the semester to help facilitate the provision of needed emergency assistance.

Diversity. Disrespect of other students in the form of verbal or written threats, attacks, or insults on the basis of gender, race, physical disability, physical stature, culture, socio-economic class, creed, sexual preference, mental disability or any form of social group membership will not be tolerated.

Title IX reporting requirements. Manchester University is committed to fostering a safe community where the infinite worth of all individuals are respected. Title IX and institutional policy prohibit discrimination on the basis of sex and gender identity. Consequently, sexual misconduct—including harassment, domestic and dating violence, sexual assault, and stalking—is also prohibited at Manchester. Faculty, staff and administrators encourage anyone experiencing sexual misconduct, dating/domestic violence, or stalking to talk to someone about what happened, so they can get the support they need and Manchester University can respond appropriately.

If you wish to speak confidentially with a Manchester employee/on-campus representative about an incident of sexual misconduct, please contact:

MU Counseling Services (260-982-5306)

MU Health Services (260-982-5306)

MU Campus Pastor (260-982-5243)

North Manchester Campus Victim Advocate (260-563-4407)

Off-campus resources include the following:

Hands of Hope (Service to North Manchester Campus-24/7 Hotline 260-563-4407)

Fort Wayne Sexual Violence Treatment Center (Service to both Fort Wayne & North Manchester Campuses-24/7 Hotline 260-423-2222)

YWCA of Northeast Indiana (Domestic Violence & Sexual Violence: 260-447-7233)

If you wish to file a report of sexual misconduct, please contact:

Dean of Student Experience/Title IX Coordinator Allen Machielson at 260-982-5052 or/and Manchester University Campus Safety (260-982-5999)

If you have questions about institutional policies and procedures regarding sexual misconduct, please contact the Title IX Coordinator. If you would like to make a police report contact the North Manchester Police Department (260-983-8555) or Fort Wayne Police Department (260-472-1222).

You can learn more about Title IX and survivor support at the following websites:

<https://www.manchester.edu/about-manchester/university-priorities/title-ix> &

<https://www.manchester.edu/student-life/care-initiative/care-intitiative-home>.

Manchester University strives to uphold privacy and confidentiality as much as possible and only shares information received with those who have a need to know in order to respond. Individuals who desire anonymity in discussing and seeking assistance about sexual misconduct should contact and/or be referred to a confidential employee.

Starfish: Student Success and Intervention Coordination System. This course participates in Starfish Early Alert, which is designed to support students' academic success, persistence and graduation. When a concern arises that the Instructor believes may impede or disrupt a student's academic success, the instructor will raise an alert flag that notifies the student about the concern and/or refer the student to key individuals within the student's success network. If a student receives an email notification of an early alert, it is that student's responsibility to contact the instructor as soon as possible to discuss the issue. The purpose of the contact should be to determine the severity of the issue and develop an action plan to be successful in the course. The Starfish program is coordinated through the Success Center. For more information or questions contact Starfish Support at starfishsupport@manchester.edu or the Success Center directly by phone at 260-982-5888.

SENIORITIS

For some of you this will be your last term of study at Manchester. Even though there are important life decisions made during this term, do not lose your focus. Employers and graduate and professional schools may withdraw their offers if your performance slips below their expectations. This semester is not the time to ease up.

GRADING

Grades are based on results, not effort. My grading philosophy is that using a variety of methods to evaluate your progress is more beneficial than over-reliance on a few large exams. Additionally, spreading out tests and assignments over the semester encourages you to keep up with the course material and provides many opportunities to succeed in this class. To encourage cooperation in learning, grading will not be calculated on a standard curve. Grades will be determined by the percentage of total possible points earned, as shown in the box to the right. Below is an estimate of the final point total. Additional assignments may be given that would alter it, but the percent of total point scale for each letter grade is **absolute**.

Grading Scale

| | | |
|-----------|------------|------------|
| A | 4.0 | 93% |
| A- | 3.7 | 90% |
| B+ | 3.3 | 87% |
| B | 3.0 | 83% |
| B- | 2.7 | 80% |
| C+ | 2.3 | 77% |
| C | 2.0 | 73% |
| C- | 1.7 | 70% |
| D+ | 1.3 | 67% |
| D | 1.0 | 63% |
| D- | 0.7 | 60% |

Tentative Point Distribution:

| | | | |
|---|-----|-----------------|------------|
| Exams | 4 | 4 @ 100 pt each | 400 |
| Biodegradation Pathway Project | | | 100 |
| Biodegradation Pathway Project Peer Reviews | | | 10 |
| Problems | 140 | @ 1 pt each | 140 |
| Activities | 4 | @ 8 pt each | 32 |
| <u>ACS Standardized Full Year Exam</u> | | | <u>100</u> |
| TOTAL | | | 772 |

HOMEWORK PROBLEMS

Each day's problems will be due at the beginning of the next class period, and each question will be worth one point. Each question must be answered thoroughly and correctly in order to gain the full points. There will be a substantial penalty for late or incomplete problem sets.

BIODEGRADATION PATHWAY PROJECT

Interspecies transfer of DNA segments and DNA point mutations are the primary means by which degradation pathways are formed in nature. The biodegradation pathway project will involve finding in the literature and then presenting a pathway through which a compound can enter intermediary metabolism. Depending on the quality of the work, this pathway will be published on the EAWAG Biocatalysis/Biodegradation Database (**EAWAG-BBD**; <http://eawag-bbd.ethz.ch/>). The EAWAG-BBD contains information on microbial, biocatalytic reactions and biodegradation pathways for primarily xenobiotic, chemical compounds. This database is a valuable, publicly-available resource provided to the scientific community and you would be adding to its worth.

READINGS

The textbook is a resource, but does not determine nor contain the full content of the course. Readings are expected to be completed prior to the lecture for which they are assigned. In addition, various, essays, stories and poems will be assigned throughout the semester. The purpose of the assignments is to stimulate your thinking about biochemistry from points of view that you perhaps do not normally assume. They are intended to work towards the goal of being a “Well-Read Biochemist.”

| Class | Date | Topic | Reading (Chapter.Section) | Other |
|-------|--------|-----------------------------|--|-------------------------------------|
| 1 | 31 Jan | Genetics | Voet and Voet (part 4 Genetics, stopping before part D Bacterial Genetics) reading on Canvas | |
| 2 | 2 Feb | DNA Packing | 32.1 | |
| 3 | 5 Feb | Nanotechnology | none | |
| 4 | 7 Feb | DNA Sequencing | 1.4, 5.1, 5.3 | |
| 5 | 9 Feb | Genomics | 5.2-5.3 | |
| 6 | 12 Feb | DNA Mutations | 28.4 | |
| 7 | 14 Feb | DNA Rearrangement | 28.5 | |
| 8 | 16 Feb | DNA Rearrangement | | |
| 9 | 19 Feb | | | Exam 1 |
| 10 | 21 Feb | Prokaryotic Gene Expression | Chapter 31 | |
| 11 | 23 Feb | Eukaryotic Gene Expression | Chapter 32 | |
| 12 | 26 Feb | Protein Targeting | 30.6 | <i>Biodegradation Project 1 Due</i> |
| 13 | 28 Feb | DNA Manipulation 1 | 5.1-5.2 | |
| 14 | 2 Mar | DNA Manipulation 2 | 5.4 | |
| 15 | 5 Mar | Fatty Acid Biosynthesis | 22.4-22.6; Section 37 in Loertscher et al | |
| 16 | 7 Mar | Fatty Acid Biosynthesis | | |
| 17 | 9 Mar | Steroids | Chapter 26 | |
| 18 | 12 Mar | Steroids | | |
| 19 | 14 Mar | Steroids | | |
| 20 | 16 Mar | | | Exam 2 |
| | 19 Mar | <i>Spring Break</i> | | |
| | 21 Mar | <i>Spring Break</i> | | |
| | 23 Mar | <i>Spring Break</i> | | |
| 21 | 26 Mar | Molecular Motors | 9.4, 35 | |

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|----|-----------|---|--|--|
| 22 | 28 Mar | Photosynthesis Light Reaction | 19.1-19.6 | <i>Biodegrad. Project 2abcdefg Due</i> |
| | 30 Mar | <i>Good Friday</i> (no class) | | |
| 23 | 2 Apr | Photosynthesis Light Reaction | | |
| 24 | 4 Apr | Photosynthesis Dark Reaction | 20.1-20.2 | |
| 25 | 6 Apr | Photosynthesis Dark Reaction | | |
| 26 | 9 Apr | Pentose Phosphate Pathway | 20.3-20.5; Section 31 in Loertscher et al | |
| 27 | 11 Apr | Glycogen and Carbohydrate Metabolism | 11.2-11.3, 21.1-21.5; Section 28 in Loertscher et al | |
| 28 | 13 Apr | | | Exam 3 |
| 29 | 16 Apr | Nitrogen Uptake and Amino Acid Biosynthesis | Chapter 24 | |
| 30 | 18 Apr | Nitrogen Uptake and Amino Acid Biosynthesis | | |
| 31 | 20 Apr | Nucleotide Biosynthesis | Chapter 25 | |
| 32 | 23 Apr | Nucleotide Biosynthesis | | |
| 33 | 25 Apr | Amino Acid Catabolism | Chapter 23–Section 38 in Loertscher et al | |
| 34 | 27 Apr | Nucleotide Catabolism | 25.5 | <i>Biodegradation Project 2hi Due</i> |
| 35 | 30 Apr | Immune System | Chapter 34 Intro- 34.3 | |
| 36 | 2 May | Immunoglobulin Structure and Diversity | 3.2, 34 Intro-34.3 | <i>Biodegradation Peer Reviews Due</i> |
| 37 | 4 May | Cell-Mediated Immune Response | 34.4-34.5 | |
| 38 | 7 May | Metabolic Integration | 27; Section 39 in Loertscher et al | |
| 39 | 9 May | Case Study | | |
| 40 | 11 May | | | Exam 4 |
| 41 | 14 May | <i>Reading Day</i> (no class) | | <i>Final Biodegrad. Project Due</i> |
| | 15-18 May | | | Final Exams |