# BIOCHEMISTRY I – BIOL/CHEM 3361.001

# BIOCHEMISTRY WORKSHOP I – BIOL 3161.001-010

# MODERN BIOCHEMISTRY I – BIOL 6352.001

## FALL 2013 TR 1:00-2:15 HH2.402

| Instructor | Room No. | Telephone | E-Mail | Office Hours |
|---|---|---|---|---|
| Robert Marsh | FN3.202 | 469-222-9289 | rmarsh@utdallas.edu | TR 2:45-3:45 |
| Stephen Spiro | FO3.611 | 972-UTD-6896 | stephen.spiro@utdallas.edu | TR 3:00-4:00 |

**Corequisites:** Concurrent registration in Biochemistry Workshop I (BIOL 3161, Sections 001 - 010) is required for both BIOL and CHEM undergraduate students**.**

**Prerequisites:** CHEM 2323 and 2325 or equivalent.

**Course description:** Structures and chemical properties of amino acids; protein purification and characterization; protein structure and thermodynamics of polypeptide chain folding; catalytic mechanisms, kinetics and regulation of enzymes; energetics of biochemical reactions; metabolism; roles of coenzymes and prosthetic groups in redox reactions; pathways for carbohydrate oxidation; glycogen metabolism; glucose synthesis; electron transport and oxidative phosphorylation.

**Objectives:** This undergraduate core course is the first of a two-course sequence that provides students with a working knowledge of the macromolecules and fundamental metabolic pathways of prokaryotes and eukaryotes, with emphasis on human systems. Biochemistry I is devoted to mastering 1) the structure and function of amino acids and proteins and 2) central metabolism and energy conservation, as a means of understanding biological processes in general and developing problem-solving skills in biochemistry. Fundamental thermodynamic principles that drive life processes and the regulatory mechanisms that fine-tune them are stressed in order to provide the rationale and framework for students to master the necessary molecular structure and pathways. Relevance to human physiology, medicine, and genetics is used to stimulate students to begin the integration of biochemistry with other disciplines.

**Outcomes:** Students will be able to:

1. Explain the basic thermodynamics governing biochemical reactions and use this information to solve problems involving biochemical thermodynamics.
2. Recognize the molecular structures and describe the chemical properties of proteins, their amino acid residues, and carbohydrates; and solve related pH problems.
3. Explain enzyme catalysis and regulation, and apply enzyme kinetics in problem solving.
4. Describe the central pathways for the catabolism of glucose and complex carbohydrates, and gluconeogenesis
5. Understand the organization of electron transport chains, and the different mechanisms for ATP synthesis

**Required textbook and OWL access code:**

R.H. Garrett and C.M. Grisham: *Biochemistry*, 5th edition, plus the online "*OWL YouBook with Student Solutions Manual"*, Brooks/Cole, Cengage Learning. The online *OWLYouBook* comprises learning modules and self-assessment problem sets as well as an electronic copy of the Garrett and Grisham text. If you are satisfied with an e-text, you need only purchase the online "*OWL YouBook with Student*

*Solutions Manual".* If you additionally want a print copy of the text, it is available hardbound or loose-leaf. The three options are:

Hardbound Text + Printed Access (24 month) Card for OWL YouBook with Student Solutions Manual (**ISBN-10**: 1-133-84875-3 or **ISBN-13**: 978-1-133-84875-2)
Loose-leaf Text + Printed Access (24 month) Card for OWL YouBook with Student Solutions Manual (**ISBN-13**: 978-1-285-13161-0)
Online electronic: Printed (24 month) Access Card for OWL YouBook with Student Solutions Manual (**ISBN-10**: 1-133-35232-4 or **ISBN-13**: 978-1-133-35232-7)

These options are available from bookstores or directly from the publisher.

**eLearning website:** From the UTD homepage, log onto the BIOL/CHEM 3361.001 eLearning website for class notes, problem sets, practice exams, announcements, your grades, etc. and to submit questions and communicate with other students in the class. **Instructions for registering and logging onto the OWL website** also are posted on the class eLearning site.

# *Class schedule FALL, 2013*

| | | | | |
|---|---|---|---|---|
| Tue | 8/27 | Introduction, Weak Interactions | Chap 1 | Marsh |
| Thur | 8/29 | Water and Acid/Base Properties | Chap 2 | Marsh |
| Tue | 9/3 | Thermodynamics of Biological Systems | Handout on eLearning as substitute for Chap 3 | Marsh |
| Thur | 9/5 | Thermodynamics of Biological Systems cont. | Handout cont'd | Marsh |
| Tue | 9/10 | Amino Acids | Chap 4 | Marsh |
| Wed | 9/11 | LAST DAY TO DROP WITHOUT A "W" | | |
| Thur | 9/12 | Proteins: Primary Structure and Function | Chap 5 | Marsh |
| Tue | 9/17 | Protein Purification and Characterization | Chap 5 | Marsh |
| Thur | 9/19 | Protein Secondary, Tertiary and Quaternary Structure, Part 1 (will be on exam 2) | Chap 6 (slides 1-28 in notes) | Marsh |
| Fri | 9/20 | **Problem Set 1 Due by 5:00 pm in FO 3.602 (No late sets accepted.)** | | |

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| Tue | 9/24 | **EXAM #1**<br>Bring a scantron form F-1712 for the exam | Chaps 1-5 | Marsh |
| Thur | 9/26 | Enzyme Kinetics | Chap 13 | Marsh |
| Tue | 10/1 | Inhibition Kinetics; Irreversible Inhibition<br>Bisubstrate Kinetics | Chap 13 | Marsh |
| Thur | 10/3 | Enzyme Mechanisms | Chap 14 | Marsh |
| Tue | 10/8 | Enzyme Mechanisms cont'd | Chap 14 | Marsh |
| Thur | 10/10 | Protein Secondary, Tertiary and Quaternary Structure, Part 2<br>Protein Denaturants; Protein Folding and Folding Diseases; Chaperones | Chap 6<br>Chap 31.1 on pp 987-993 (slides 29-55 in notes) | Marsh |
| Fri | 10/11 | **Problem Set 2 Due by 5:00 pm in FO 3.602** | | |
| Tue | 10/15 | **EXAM #2**<br>Bring a scantron form F-1712 for the exam | Chaps 6, 13, 14, Chap 31.1 pp 987-993 | Marsh |
| Thur | 10/17 | Enzyme Regulation; Mechanisms of Allostery | Chap 15 | Spiro |
| Tue | 10/22 | Allostery in hemoglobin | Chap 15 | Spiro |
| Thur | 10/24 | Overview of Metabolism: Catabolism and Anabolism | Chap 17 | Spiro |
| Tue | 10/29 | Carbohydrates | Chap 7 | Spiro |
| Thur | 10/31 | LAST DAY TO WITHDRAW FROM UG COURSE | | |
| Thur | 10/31 | Glycolysis: First Phase | Chap 18 | Spiro |
| Tue | 11/5 | Glycolysis: Second Phase | Chap 18 | Spiro |
| Thur | 11/7 | Gluconeogenesis | Chap 22 (part 1) | Spiro |
| Fri | 11/8 | **Problem Set 3 Due by 5:00 pm in FO 3.602** | | |
| Tue | 11/12 | **EXAM #3**<br>Bring a scantron form F-1712 for the exam | Chaps 7, 15, 17,18, 22 (part 1) | Spiro |
| Thur | 11/14 | Glycogen Metabolism and Pentose Phosphate Pathway | Chap 22 (part 2) | Spiro |

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| | | | | |
|---|---|---|---|---|
| Tue | 11/19 | The Tricarboxylic Acid Cycle | Chap 19 | Spiro |
| Thur | 11/21 | The Tricarboxylic Acid Cycle and the Glyoxylate Shunt | Chap 19 cont'd | Spiro |
| Tue | 11/26 | FALL BREAK | | |
| Thur | 11/28 | THANKSGIVING | | |
| Tue | 12/3 | Electron Transport | Chap 20 | Spiro |
| Thur | 12/5 | Electron Transport | Chap 20 cont'd | Spiro |
| Tue | 12/10 | ATP synthesis | Chap 20 cont'd | Spiro |
| Wed | 12/11 | **Problem Set 4 Due by 5:00 pm in FO 3.602** | | |
| TBA | 12/?? | **FINAL: EXAM #4**<br>**NOTE: EXAM IS AT ?? AM**<br>Bring a scantron form F-1712 for the exam | Chaps 19, 20, 22 (part 2) | Spiro |

***Teaching Assistants***

| | |
|---|---|
| Raheel Ata | raheel.ata@utdallas.edu |
| John Hamati | john.hamati@utdallas.edu |
| Parisa Khosravi | pxk121130@utdallas.edu |
| Gabriella Nguyen | ghn100020@utdallas.edu |
| Jason Ryan Plata | jrp130130@utdallas.edu |
| Chris Sebastian | cxs119530@utdallas.edu |
| Lal Sneha | sxl114530@utdallas.edu |
| Zachary Tran | zack.tran92@utdallas.edu |
| Bryan Yu | itsyu@utdallas.edu |

***Workshop Sections***

BIOCHEMISTRY WORKSHOP I - You are free to attend any section.

| Section | day | time | room | TA |
|---|---|---|---|---|
| Sec 001 | F | 12:00 PM – 12:50 PM | FO 3.616 | Bryan Yu |
| Sec 002 | F | 12:00 PM – 12:50 PM | FN 2.106 | Parisa Khosravi |
| Sec 003 | Tu | 8:30 AM – 9:20 AM | FO 2.404 | Zachary Tran |
| Sec 004 | W | 12:00 PM – 12:50 PM | FO 3.616 | Chris Sebastian |
| Sec 005 | M | 2:00 PM – 2:50 PM | FN 2.106 | TBA |

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|---|---|---|---|---|
| Sec 006 | W | 2:00 PM – 2:50 PM | GR 3.302 | John S Hamati |
| Sec 007 | M | 4:00 PM – 4:50 PM | FO 3.616 | Jason Plata |
| Sec 008 | W | 4:00 PM – 4:50 PM | FO 3.616 | Gabriella Nguyen |
| Sec 009 | M | 12:00 PM – 12:50 PM | SLC 2.302 | TBA |
| Sec 010 | W | 8:00 AM – 8:50 AM | FO 3.616 | Raheel Ata |

***Workshop Schedule***

| | | |
|---|---|---|
| Mon, Tue, Wed, Fri | 8/26 – 8/30 | pH calculations, HH equation |
| Mon (Labor Day Holiday) | 9/2 | (Students in the Monday workshops should attend one of the other workshops this week.) |
| Tue, Wed, Fri | 9/3 – 9/6 | pH calculations, HH equation |
| Mon, Tue, Wed, Fri | 9/9 – 9/13 | Thermodynamics |
| ″ | 9/16 – 9/20 | Peptide sequencing & purification |
| ″ | 9/23 – 9/27 | Protein structure |
| ″ | 9/30 – 10/4 | Enzyme kinetics |
| ″ | 10/7 – 10/11 | Enzyme kinetics; Enzyme mechanisms |
| ″ | 10/14 – 10/18 | Enzyme regulation |
| | 10/21 – 10/25 | Enzyme regulation |
| ″ | 10/28 – 11/1 | Metabolism; Carbohydrates |
| ″ | 11/4 – 11/8 | Glycolysis and Gluconeogenesis |
| ″ | 11/11 – 11/5 | Glycogen metabolism |
| ″ | 11/18 – 11/20 | TCA cycle |
| Mon – Fri (Fall Break and Thanksgiving Holiday) | 11/25 – 11/29 | No Workshops |
| Mon, Tue, Wed, Fri | 12/2 – 12/6 | Electron transport and ATP synthesis |
| Mon, Tue, Wed | 12/9 – 12/11 | No Workshops |

**Grading:** Four (4) class-period exams (20% each, 80% total) + adjusted workshop/online OWL problem-set/online -OWL score (20%, see below).

**Workshop Problem Sets:** There will be four assigned problem sets, which will be posted successively online at eLearning, starting at the beginning of the semester and immediately after each examination. Completed problems must be **turned in by the following dates and times:**

**Set 1 Friday Sept. 20 by 5:00 PM**

**Set 2 Friday Oct. 11 by 5:00 PM**

**Set 3 Friday Nov. 8 by 5:00 PM**

**Set 4 Wednesday Dec. 11 by 5:00 PM**

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These due dates were set to allow all students to meet the same number of workshop sessions before each turn-in date. On these dates the problems sets will be **due by 5:00 PM in the office of Shawanda Dunagin, FO 3.602**. You may also turn in your problems sets before the due date at lecture or in workshop. **For full credit, all steps to the solution of problems must be shown.** Complete answers to problems will be posted on ELearning following the due date. **If you have a question regarding the grading of your problem sets, first contact the graduate TA Lal Sneha, who will be in charge of the grading.**

**OWL Problem Sets:** There will be chapter mastery questions and self-assessment problems to be completed online at the text publisher's OWL website (www.cengage.com/owl) for each of the 15 chapters we will cover. You will need an access code bundled together with your text. **Instructions for registering and logging onto the OWL website** are posted on the class eLearning site. The OWL questions and problems for the 15 chapters will be divided into 4 sets, due online successively at the same time as the Workshop Problem Sets I. The composite score for all OWL mastery questions and self-assessment problems will be counted as equivalent to one workshop problem set score.

**Adjusted workshop/OWL problem set score:** Your workshop/OWL problem-set average will be calculated after dropping the lowest of the five scores.

***Grades**- At the end of the semester an average of your four exam scores plus your adjusted problem-set score will be computed and scaled between 0 and 100 points. Your final letter grade will be no worse than that based on the following scale:

| Letter Grade | Score Range |
|---|---|
| A- to A+ | 86-100 |
| B- to B+ | 75-85 |
| C- to C+ | 65-74 |
| D- to D+ | 55-64 |
| F | < 55 |

If your final mean numerical score is fractional it will be rounded off to the nearest integer value: i.e., 0.5 - 0.9 will be rounded up to the next highest whole number. In other words 85.5 would be rounded to 86 and the student would receive an A grade, but 85.4 would be rounded to 85 and the student would receive a B grade.

**You will receive the same letter grade in both BIOL/CHEM 3361 and BIOL 3161**

**Course Policies**

*Make-up exams*: There will be no make-up exams except for the most extreme of documented circumstances. If you do miss an exam, the score will be recorded as 0.

*Problem Sets*: Problem sets will not be accepted after the due dates. If you do miss a due date, the score will be recorded as 0.

*Use of portable electronics*: **Cellular telephones and pagers must be turned off and put away during lectures and exams. Any cellphone use during an exam will be considered grounds for a charge of academic dishonesty.** Laptops and tablets may be used, but for class-related activities only. Programmable calculators used for exams must have their memory cleared and may be checked for this during exams.

*BIOL 6352 students*: If you have registered for this course under the graduate listing BIOL 6352, all of the above apply, except that you are not required to register for a workshop (you may, of course, attend if you wish). Examinations will consist of two parts: one part that is substantially similar to that taken by undergraduate students enrolled in the class and a second part that will contain one or more additional problems.

*ELearning*: Notes and slides used in lecture, problem sets, class announcements, scores, and practice exams will be posted on ELearning, which is accessible through Orion on the UTDallas Homepage.

## Student Conduct & Discipline

The University of Texas System and The University of Texas at Dallas have rules and regulations for the orderly and efficient conduct of their business. It is the responsibility of each student and each student organization to be knowledgeable about the rules and regulations which govern student conduct and activities. General information on student conduct and discipline is contained in the UTD publication, *A to Z Guide*, which is provided to all registered students each academic year.

The University of Texas at Dallas administers student discipline within the procedures of recognized and established due process. Procedures are defined and described in the *Rules and Regulations, Board of Regents, The University of Texas System, Part 1, Chapter VI, Section 3*, and in Title V, Rules on Student Services and Activities of the university's *Handbook of Operating Procedures*. Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations (SU 1.602, 972/883-6391).

A student at the university neither loses the rights nor escapes the responsibilities of citizenship. He or she is expected to obey federal, state, and local laws as well as the Regents' Rules, university regulations, and administrative rules. Students are subject to discipline for violating the standards of conduct whether such conduct takes place on or off campus, or whether civil or criminal penalties are also imposed for such conduct.

## Academic Integrity

The faculty expects from its students a high level of responsibility and academic honesty. Because the value of an academic degree depends upon the absolute integrity of the work done by the student for that degree, it is imperative that a student demonstrate a high standard of individual honor in his or her scholastic work.

Scholastic dishonesty includes, but is not limited to, statements, acts or omissions related to applications for enrollment or the award of a degree, and/or the submission as one's own work or material that is not one's own. As a general rule, scholastic dishonesty involves one of the following acts: cheating, plagiarism, collusion and/or falsifying academic records. Students suspected of academic dishonesty are subject to disciplinary proceedings.

Plagiarism, especially from the web, from portions of papers for other classes, and from any other source is unacceptable and will be dealt with under the university's policy on plagiarism (see general catalog for details). This course will use the resources of turnitin.com, which searches the web for possible plagiarism and is over 90% effective.

## Email Use

The University of Texas at Dallas recognizes the value and efficiency of communication between faculty/staff and students through electronic mail. At the same time, email raises some issues concerning security and the identity of each individual in an email exchange. The university encourages all official student email correspondence be sent only to a student's U.T. Dallas email address and that faculty and staff consider email from students official only if it originates from a UTD student account. This allows the university to maintain a high degree of confidence in the identity of all individual corresponding and the security of the transmitted information. UTD furnishes each student with a free email account that is to be used in all communication with university personnel. The Department of Information Resources at U.T. Dallas provides a method for students to have their U.T. Dallas mail forwarded to other accounts.

## Withdrawal from Class

The administration of this institution has set deadlines for withdrawal of any college-level courses. These dates and times are published in that semester's course catalog. Administration procedures must be followed. It is the student's responsibility to handle withdrawal requirements from any class. In other words, I cannot drop or withdraw any student. You must do the proper paperwork to ensure that you will not receive a final grade of "F" in a course if you choose not to attend the class once you are enrolled.

## Student Grievance Procedures

Procedures for student grievances are found in Title V, Rules on Student Services and Activities, of the university's *Handbook of Operating Procedures*.

In attempting to resolve any student grievance regarding grades, evaluations, or other fulfillments of academic responsibility, it is the obligation of the student first to make a serious effort to resolve the matter with the instructor, supervisor, administrator, or committee with whom the grievance originates (hereafter called "the respondent"). Individual faculty members retain primary responsibility for assigning grades and evaluations. If the matter cannot be resolved at that level, the grievance must be submitted in writing to the respondent with a copy of the respondent's School Dean. If the matter is not resolved by the written response provided by the respondent, the student may submit a written appeal to the School Dean. If the grievance is not resolved by the School Dean's decision, the student may make a written appeal to the Dean of Graduate or Undergraduate Education, and the deal will appoint and convene an Academic Appeals Panel. The decision of the Academic Appeals Panel is final. The results of the academic appeals process will be distributed to all involved parties.

Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations.

## Incomplete Grade Policy

As per university policy, incomplete grades will be granted only for work unavoidably missed at the semester's end and only if 70% of the course work has been completed. An incomplete grade must be resolved within eight (8) weeks from the first day of the subsequent long semester. If the required work to complete the course and to remove the incomplete grade is not submitted by the specified deadline, the incomplete grade is changed automatically to a grade of **F**.

## Disability Services

The goal of Disability Services is to provide students with disabilities educational opportunities equal to those of their non-disabled peers. Disability Services is located in room 1.610 in the Student Union. Office hours are Monday and Thursday, 8:30 a.m. to 6:30 p.m.; Tuesday and Wednesday, 8:30 a.m. to 7:30 p.m.; and Friday, 8:30 a.m. to 5:30 p.m.

The contact information for the Office of Disability Services is:
The University of Texas at Dallas, SU 22
PO Box 830688
Richardson, Texas 75083-0688
(972) 883-2098 (voice or TTY)

Essentially, the law requires that colleges and universities make those reasonable adjustments necessary to eliminate discrimination on the basis of disability. For example, it may be necessary to remove classroom prohibitions against tape recorders or animals (in the case of dog guides) for students who are blind. Occasionally an assignment requirement may be substituted (for example, a research paper versus an oral presentation for a student who is hearing impaired). Classes enrolled students with mobility impairments may have to be rescheduled in accessible facilities. The college or university may need to provide special services such as registration, note-taking, or mobility assistance.

It is the student's responsibility to notify his or her professors of the need for such an accommodation. Disability Services provides students with letters to present to faculty members to verify that the student has a disability and needs accommodations. Individuals requiring special accommodation should contact the professor after class or during office hours.

## Religious Holy Days

The University of Texas at Dallas will excuse a student from class or other required activities for the travel to and observance of a religious holy day for a religion whose places of worship are exempt from property tax under Section 11.20, Tax Code, Texas Code Annotated.

The student is encouraged to notify the instructor or activity sponsor as soon as possible regarding the absence, preferably in advance of the assignment. The student, so excused, will be allowed to take the exam or complete the assignment within a reasonable time after the absence: a period equal to the length of the absence, up to a maximum of one week. A student who notifies the instructor and completes any missed exam or assignment may not be penalized for the absence. A student who fails to complete the exam or assignment within the prescribed period may receive a failing grade for that exam or assignment.

If a student or an instructor disagrees about the nature of the absence [i.e., for the purpose of observing a religious holy day] or if there is similar disagreement about whether the student has been given a reasonable time to complete any missed assignments or examinations, either the student or the instructor may request a ruling from the chief executive officer of the institution, or his or her designee. The chief executive officer or designee must take into account the legislative intent of TEC 51.911(b), and the student and instructor will abide by the decision of the chief executive officer or designee.

## Off-Campus Instruction and Course Activities

Off-campus, out-of-state, and foreign instruction and activities are subject to state law and University policies and procedures regarding travel and risk-related activities. Information regarding these rules and regulations may be found at the website address given below. Additional information is available from the office of the school dean. (http://www.utdallas.edu/Business Affairs/Travel_Risk_Activities.htm)