

**DEPARTMENT OF BIOCHEMISTRY****BCHM 462 – Metabolism  
Fall Semester, 2017****BCHM 462, Syllabus  
Course Information, Grading Policy and Class Schedule**

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*\*Additional office hours may be arranged by appointment only.*

**COURSE OBJECTIVES**

A BCHM 462 class includes undergraduate students with an array of future interests including, but not limited to, careers in human medicine, veterinary medicine, pharmacy and pharmacology, and academic research and teaching. This course will provide students with an understanding of core metabolic pathways and how they are regulated. Anabolic and catabolic processes of metabolic pathways will be studied at the biochemical, structural and molecular level. We will cover the detailed metabolic pathways include glucose metabolism, oxidative phosphorylation, photosynthesis, Calvin cycle, and metabolism of lipid, amino acids and nucleotides. The students will learn to appreciate a broad and thorough understanding of how the fundamental biochemical pathways regulate cellular metabolism and relate these to medicine, agriculture, and human disease.

**LEARNING OUTCOMES**

- BCHM 462 students will understand the molecular principles of life based on the core disciplines of biology, chemistry and physics.
  - BCHM 462 students will be able to describe the chemical structures of the building blocks of biological macromolecules, including amino acids, nucleotides, sugars and fatty acids.
  - BCHM 462 students will understand how energy is harvested and utilized by biological systems.

- BCHM 462 students will demonstrate knowledge of metabolic enzymes, the reactions they catalyze in various pathways and their regulation.
- BCHM 462 students will understand the relationship between catabolic and anabolic pathways, principles of enzyme catalysis and regulation.
- BCHM 462 students will understand the contributions of our discipline to society, including improvements to medicine, agriculture, the economy and the environment.

## TEXTBOOK

### Required Textbook:

This textbook is recommended.

Biochemistry, (8<sup>th</sup> Edition) 2015 by J. M. Berg , J. L. Tymoczko, G. J. Gatto Jr. & L. Stryer.  
ISBN-13: 978-1-4641-2610-9

Biochemistry, (5<sup>th</sup> Edition) can be found online at:

<http://www.ncbi.nlm.nih.gov/books/NBK21154/>

## LECTURE TIME AND PLACE

T, TH 12:00-1:15 PM, Lilly 3410

All lectures will be recorded, and will be available for students who miss a class or who would like to review a lecture. They can be downloaded at <http://www.itap.purdue.edu/learning/tools/boilecast/>. It is not the responsibility of the instructor if the lectures are not clear or are not available for technical reasons. This is not a substitute for class and all students are expected to come to class

## BLACKBOARD

The syllabus for the course and lecture notes, will be available via the Purdue University Blackboard Learn site at: <http://www.itap.purdue.edu/learning/tools/blackboard/>

## ASSESSMENT

**Grading Policy:** The grading for this course will be as follows:

### Points Summary

Activity	Points
Midterm Exam I	100
Midterm Exam II	100
Final Exam	100
Quizzes (5 total)	100
<b>Total</b>	<b>400</b>
<b>Optional Extra Credit</b>	<b>TBA</b>

**The cutoff values for letter grades**

Grade	Percent Range
<b>A+</b>	<b>110% (with bonus points)</b>
<b>A</b>	<b>100 - 90.0</b>
<b>B</b>	<b>90.0 - 80.0</b>
<b>C</b>	<b>80.0 - 70.0</b>
<b>D</b>	<b>69.9 – 50.0</b>
<b>F</b>	<b>&lt;50.0</b>

Letter grades may be accompanied by plusses and minuses with cutoffs to be determined at the end of the semester at the sole discretion of the instructor. The exceptions are: no plusses and minuses are given for letter grades of D or F. In no case will a student receive a higher grade than someone with a higher numerical score.

**Exams and Quizzes:**

There will be **5 quizzes** and **3 exams**. The exams are *not* cumulative, but do **require an understanding of the prior material**. The quizzes and exams will cover assigned reading from textbook and any material covered in lectures and discussions. All quizzes and exams 1 and 2 will be held during normal class period. The date and place of the third and final exam will be announced when scheduled. This final exam will only be given at the University designated time.

**You can find a sample of the types of questions for Exam and Quiz at the end of this syllabus.**

Missing an exam or quiz will result in a grade of zero being recorded unless a documented and reasonable justification for the absence is presented. If you are too ill to take an exam/quiz or have a valid reason for being absent, you must notify Dr. Gowher's by e-mail/phone **prior to the examination time**. Any request to be excused from a quiz or exam must include official documentation (doctor's note, request from academic advisor, etc) explaining why the exam was or will be missed. Cases will be handled on an individual basis, at the discretion of the course instructor and makeup tests, if given, will be scheduled in consultation with the instructor. Every effort will be made to grade and return exams/quizzes within a week.

**Re-grading of exams:**

Requests for re-grades must be submitted no later than the end of the second class period after the graded test or assignment has been returned.

If you feel that grading errors have been made, see the TA first. However, all changes must be approved by Dr. Gowher. See Dr. Gowher to appeal the TA's decisions. Such appeals to the instructor must be in writing. The instructor has the option to re-grade the entire exam/quiz. If the exam/quiz was not completed in ink the TA and course instructor has the option not to re-grade the exam.

**EXTRA CREDIT**

At the discretion of the instructor, there may be opportunity for extra credit. Weekly homework assignments and pre-exam study guide assignments will be used to earn extra-credit.

**OBTAINING EXTRA HELP**

Dr. Gowher will be available to answer your questions immediately after class, or by appointment (arranged in class or by e-mail). Alternatively, you can submit questions by e-mail that can be answered in class or by return e-mail. E-mails will be mainly answered during office hours.

The lecture TA will hold office hours for at least 3 hours per week, and will be able to answer additional hours by appointment.

### Study Suggestions:

We will cover large amounts of material in BCHM 462 including learning metabolic pathways, enzymes, reaction types their relationship and their regulation. Therefore, it is important to keep up on the reading and reviewing of material. Last minute cramming is usually not successful in BCHM 462.

**Do** come to class and actively listen.

**Do** read the text and actively learn to remember (**memorize**).

**Do** focus on identifying key concepts.

**Do** ask questions if you do not understand the concepts.

**Do** actively draw and redraw pathways and connections.

**Do** learn to identify relevant information.

**Please do not** rely on passive reading and highlighting/underlining of the textbook.

**Please do not** sit and stare at the handouts (they are an outline, not a text).

**Please do not** try to read 50 review books. (Make your own review book instead!)

### ACADEMIC MISCONDUCT

Academic misconduct of any kind will not be tolerated in any course offered by the Department of Biochemistry. Information on Purdue's policies with regard to academic misconduct can be found at [http://www.purdue.edu/studentregulations/student\\_conduct/regulations.html](http://www.purdue.edu/studentregulations/student_conduct/regulations.html)

Any incidence of academic misconduct will be reported to the Office of the Dean of Students. Academic misconduct may result in disciplinary sanctions including expulsion, suspension, probated suspension, disciplinary probation, and/or educational sanctions. In addition, such misconduct will result in punitive grading such as:

- receiving a lower or failing grade on the assignment, or
- assessing a lower or failing grade for the course

Punitive grading decisions will be made after consultation with the Office of the Dean of Students. Please note reported incidences of academic misconduct go on record for reference by other instructors. Further, a record of academic misconduct is likely to influence how current/future situations are handled.

To provide you with an unambiguous definition of academic misconduct, the following text has been excerpted from "Academic Integrity: A Guide for Students", written by Stephen Akers, Ph.D., Executive Associate Dean of Students (1995, Revised 1999, 2003), and published by the Office of the Dean of Students in cooperation with Purdue Student Government, Schleman Hall of Student Services, Room 207, 475 Stadium Mall Drive West Lafayette, IN 47907-2050.

"Purdue prohibits "dishonesty in connection with any University activity. Cheating, plagiarism, or knowingly furnishing false information to the University are examples of dishonesty." [Part 5, Section III-B-2-a, [Student Regulations](#)] Furthermore, the University Senate has stipulated that "the commitment of acts of cheating, lying, and deceit in any of their diverse forms (such as the use of substitutes for taking examinations, the use of illegal cribs, plagiarism, and copying during examinations) is dishonest and must not be tolerated. Moreover, knowingly to aid and abet, directly or indirectly, other parties in committing dishonest acts is in itself dishonest." [University Senate Document 72-18, December 15, 1972]

More specifically, the following are a few examples of academic dishonesty which have been discovered at Purdue University.

- substituting on an exam for another student
- substituting in a course for another student
- paying someone else to write a paper and submitting it as one's own work
- giving or receiving answers by use of signals during an exam

- copying with or without the other person's knowledge during an exam
- doing class assignments for someone else
- plagiarizing published material, class assignments, or lab reports
- turning in a paper that has been purchased from a commercial research firm or obtained from the internet
- padding items of a bibliography
- obtaining an unauthorized copy of a test in advance of its scheduled administration
- using unauthorized notes during an exam
- collaborating with other students on assignments when it is not allowed
- obtaining a test from the exam site, completing and submitting it later
- altering answers on a scored test and submitting it for a regrade
- accessing and altering grade records
- stealing class assignments from other students and submitting them as one's own
- fabricating data
- destroying or stealing the work of other students

Plagiarism is a special kind of academic dishonesty in which one person steals another person's ideas or words and falsely presents them as the plagiarist's own product. This is most likely to occur in the following ways:

- using the exact language of someone else without the use of quotation marks and without giving proper credit to the author
- presenting the sequence of ideas or arranging the material of someone else even though such is expressed in one's own words, without giving appropriate acknowledgment
- submitting a document written by someone else but representing it as one's own"

### **EMERGENCY PREPAREDNESS**

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances. To get information about changes in this course consult the class Blackboard site or e-mail or phone the instructor.

### **ON-LINE COURSE EVALUATIONS**

During the last two weeks of the semester, you will be provided an opportunity to evaluate this course and your instructor(s). To this end, Purdue has transitioned to online course evaluations. On Monday of the fifteenth week of classes, you will receive an official email from evaluation administrators with a link to the online evaluation site. You will have two weeks to complete this evaluation. Your participation in this evaluation is an integral part of this course. Your feedback is vital to improving education at Purdue University. I strongly urge you to participate in the evaluation system.

### **CLASS ATTENDANCE**

In accordance with University policy, you are expected to attend every scheduled class. If you have a valid reason for missing class such as a University-sponsored activity, religious observances, illness, or family emergency, the instructor or TA will assist you in obtaining information and materials you may have missed. Students who skip class without a valid excuse should not expect the instructor or TA to supply class notes or provide special help. For the official university policy, see: [www.purdue.edu/odos/services/classabsence.php](http://www.purdue.edu/odos/services/classabsence.php) and [http://www.purdue.edu/studentregulations/regulations\\_procedures/classes.html](http://www.purdue.edu/studentregulations/regulations_procedures/classes.html)

## LECTURE SCHEDULE (May slightly change)

Date	Day	Chapter in 8 <sup>th</sup> Edition	Exams/ Quizzes	Topic
Aug 22	T	15		Course policy Metabolism: Basic Concepts and Design
24	TH	15		Metabolism: Basic Concepts and Design
29	T	16		Glycolysis
31	TH	16		Glycolysis, Gluconeogenesis
Sep 5	T	16, 21		Gluconeogenesis and Glycogen metabolism
7	TH	21	<b>Quiz</b>	Glycogen metabolism
12	T	17		The Citric Acid Cycle
14	TH	17		The Citric Acid Cycle
19	T	18		Oxidative Phosphorylation
21	TH	18		Oxidative Phosphorylation, ATP synthesis
26	T	18	<b>Quiz</b>	Photosynthesis – Light reactions
28	TH	19		Photosynthesis – Light reactions
Oct 3	T	19		Photosynthesis – Light reactions,
<b>Oct 5</b>	TH		<b>Exam 1</b>	<b>BCHM 102: 12:00 – 1:15 pm</b>
10	T			<b>No Class – Fall Break</b>
12	TH	19, 20	<b>Quiz</b>	The Calvin Cycle and Pentose Phosphate Pathway
17	T	20		The Calvin Cycle and Pentose Phosphate Pathway
19	TH	22		Fatty Acid Degradation
24	T	22		Fatty Acid Degradation
26	TH	22	<b>Quiz</b>	Fatty Acid Synthesis
31	T	22		Fatty Acid Synthesis
Nov 2	TH	22, 23		Fatty Acid Synthesis and Urea Cycle
<b>Nov 7</b>	<b>T</b>		<b>Exam 2</b>	<b>BCHM 102: 12:00 – 1:15 pm</b>
<b>9</b>	TH	23		Amino Acid Degradation and Urea Cycle
14	T	23, 24		Amino Acid Degradation and Synthesis
16	TH	24		Amino Acid Synthesis
21	T	24		One Carbon Metabolism
<b>23</b>	<b>TH</b>			<b>No Class – Thanksgiving Vacation</b>
<b>28</b>	T	24	<b>Quiz</b>	One Carbon Metabolism
<b>30</b>	TH	25		Nucleotide Synthesis & Degradation
Dec 5	T	25		Nucleotide Synthesis & Degradation
<b>7</b>	TH	25		Nucleotide Synthesis & Degradation

**FINAL EXAM DATE, TIME, AND LOCATION TBD**

**EXAMPLE QUIZ**  
**Matching**

Choose the correct answer from the list. Not all the answers will be used.

- A) Glucokinase
- B)----
- C)-----
- D)
- E)
- F)
- G)
- H)
- I)
- J)
- K)
- L)

1. The products of glycolysis include: ATP, NADH, and \_\_\_\_\_
2. -----

**Multiple Choice**

3. During reactions utilizing the enzymes shown below, in which case(s) is ATP produced?

- I. phosphofructokinase (PFK)
- II. phosphoglycerate kinase (PGK)
- III. pyruvate kinase (PK)

- A) I
- B) II
- C) III
- D) I, II
- E) II, III

## EXAMPLE EXAM

**Exam Directions:**

You have a choice of attempting questions to get a maximum of 100 pts and indicated points from each section.

- ❖ There is no negative marking, so attempt as many as you can
- ❖ Read each question carefully and select the best answer
- ❖ Answer each question in the space provided
- ❖ Answer all questions in a brief but specific scientific manner
- ❖ Write your name on this page and initial all additional pages
- ❖ This exam is worth 100 points.

**A. Below are questions on Glycolysis. Max. earned score 20pts**

1. (2 pts) If you start with two molecules of fructose 6-phosphate and end glycolysis at phosphoenolpyruvate, what is the net output of ATP and NADH?
  - a) 2 ATP and 2 NADH
  - b) 2 ATP and 4 NADH
  - c) 4 ATP and 2 NADH
  - d) 4 ATP and 4 NADH
  - e) None of the above

(3 pts) Please justify how you derived this number.

2. (3 pt) Name the reactions in glycolysis that demonstrate substrate level phosphorylation?

(2pt) Why is this called substrate level phosphorylation?