

Syllabus

Science Prerequisites for Health Professionals

CHEM 1005: Medical Biochemistry | Fall 2016

Credits - 4

Description

Overview

Medical Biochemistry is a four credit hour course designed to lay the foundation for other basic and clinical medical sciences. The goal of this course is to learn the core concepts of biochemistry that apply to human health and disease and to cite specific examples of their application. You will be able to analyze and evaluate the most common biochemistry cited in medical literature. Furthermore, these basics will facilitate further learning in biochemistry and the health sciences.

Instructor and Support Contact Information

Check the course welcome page in Blackboard for specific instructor and support specialist contact information.

Further Assistance

Your student support specialist, listed on the course welcome page, monitors course progression and provides assistance or guidance when needed. They can assist questions regarding ordering course materials, University policies, billing, navigating the course in Blackboard, and more.

Study Lounge

The Study Lounge Discussion Board is a designated support forum in which students may engage with each other and grapple with course content. [Feel free to post questions, seek clarification, and support each other, but be mindful of UNE's Academic Integrity Policy.](#)

Your instructor will monitor this forum. However, if you are seeking specific and timely answers to questions about content-matter or your personal grades, please contact your instructor via course messages. For questions about course materials, program policy, and how to navigate and proceed through the course, please contact your Student Support Specialist through the course messaging system.

Materials

Textbook

- *Basic Medical Biochemistry: A Clinical Approach*
Leiberman and Marks, 4th edition

Learning Objectives and Outcomes

Course Objectives

Upon the completion of this course the student will be able to:

1. Identify functional groups unique to proteins, nucleic acids, lipids, and carbohydrates and describe their relevance in biological systems.
2. Interpret the role and regulation of metabolism of proteins, carbohydrates, lipids, and nucleic acids in normal physiological conditions and the changes that occur in disease processes.
3. Identify and evaluate methodologies for molecular and biochemical diagnostic testing in individuals and populations.
4. Demonstrate an understanding of cellular structure, compartmentalization, trafficking, and cellular signaling
5. Explain genomic, DNA and RNA structure and the central dogma of molecular biology, including the processes of DNA replication, transcription, and translation across eukaryotes.
6. Explain how changes in genetic and environmental factors can result in the displayed genetic variation in human populations.
7. Understand how enzymes facilitate chemical reactions and the necessity of metabolic cofactors or vitamins in these reactions; relate how these may have pharmacological applications.

Assignments

Lectures and Laboratories

Lectures

This course is designed to be completed in a 16-week period, just like an on-campus Biochemistry course. One week in this online course is equivalent to three fifty-minute lectures in a traditional classroom setting. The general rule of studying for science courses is to spend three hours studying for every one hour that you are in class. Therefore, the suggested study time for each week is nine hours above and beyond the time it takes to listen to the lecture. Please refer to the schedule below for the suggested schedule of lectures. Students may complete the course in less than 16 weeks. Each week consists of:

- Session level objectives
- Reading from Marks Medical Biochemistry
- Pre – Evaluation (see below section VII for description)
- Voice over powerpoints and associated slides
- Additional learning resources
- Week evaluation (see below section VII for description)

Laboratories

N/A

Pre-Evaluations

To evaluate your preparedness for the Week there are Pre-Evaluations linked for each session. You can take these evaluations multiple times and are a good resource for the Unit exams and Week evaluations. These evaluations *do not* contribute to your final grade.

Week Evaluations

All Weeks have an end of Week evaluation. These may be in the form of a multiple choice quiz or a fill-in the blank exercise. These quizzes are timed, non-proctored and are closed book and closed notes. The quizzes will be taken online through the course Blackboard site. Doing well on the quizzes will help prepare you for the timed-proctored exams.

Unit Exams

There will be a total of 4 exams in the course, one after each of the 4 Units. Exams after Units 1 and 3 will be taken through Blackboard and are not cumulative. Exams after Units 2 and 4 are cumulative and will be taken using Proctor U (see below for instructions).

Units 1 and 3 exams

Each exam consists of 30 multiple choice questions that cover all of the material in the respective unit, these will be taken on Blackboard similar to a Week evaluation and are closed notes, closed book. You will have up to 1.5 hours to complete these exams.

Units review tests

After you have completed all of the course material and assessments before each of the exams you will have access to a review test to help you prepare. You may take these tests as many times as you want, and they do not contribute to your final grade. The tests consist of 20 questions drawn from a pool of questions so you will have new questions each time you take the test.

Units 2 and 4 exams

Each exam will consist of 50 multiple choice questions that cover all of the material from the respective unit, as well as up to 10% of material from previous units. These exams will be taken using one of the outlined proctoring procedures below. These are closed book and closed notes exams. You may have a single blank sheet of paper to use while taking the these exams. A calculator is not necessary for this, or any of the course assessments. You will not have access to any material saved on your or any other computer. No access to the internet or other communication devices are allowed during these exams.

Retaking a Unit 2 or Unit 4 exam

You have the option of retaking either the Unit 2 or Unit 4 exam if requested. You may retake only one of these exams. **You must contact your instructor in order to exercise this option.** You will be responsible for rescheduling the exam with Proctor U and the cost of the proctoring. Your final grade for the assessment will be the average of the two scores. We strongly encourage students who score below 50% on the Unit 2 exam to retake this assessment, as this background is fundamental to the other two Units.

Examination and Grading Information

Students will have the opportunity to assess their knowledge with both formative and summative evaluations. Each Week consists of both a Pre-evaluation self-assessment (formative), and a post Week evaluation (summative). Each unit has an associated summative exam; exams after Units 2 and Units 4 are cumulative and proctored.

All Week Evaluations and Unit Exams are *closed book and closed notes*. No access to any material saved on your or any other computer, nor access to the internet or other communication devices are allowed during these exams.

Final Grade

The course grade will be determined using the weighted averages of each of the assessments outlined above.

Grading Policy

Your grade in this course will be determined by the following criteria:

Grade Breakdown

Category	Percentage
Week Evaluations	20%
Unit 1 and 3 Exams	25%
Unit 2 and 4 Exams	55%

Grade Scale

Grade	Points Grade	Point Average (GPA)
A	94 – 100%	4.00
A-	90 – 93%	3.75
B+	87 – 89%	3.50
B	84 – 86%	3.00
B-	80 – 83%	2.75
C+	77 – 79%	2.50
C	74 – 76%	2.00
C-	70 – 73%	1.75
D	64 – 69%	1.00
F	00 – 63%	0.00

Schedule

Below is a general outline of the material. For more detailed readings please follow the Week information on Blackboard.

Unit 1 – Cellular fundamentals and applications of molecular biology

Week 1: Biochemistry basics and enzymology

Course Objectives – 1,7 – At the end of this week the learner will:

- be able to illustrate the importance of key compounds in biological settings and the necessity of biological buffers.
- have an understanding of enzymes and their relevance in biological reactions.

Chapters:

Session 1:

Chpt. 4 – Water, Acids, Bases and Buffers

Chpt. 6 – Amino Acids in Proteins

Chpt. 7 – Structure-Function Relationships in Proteins

Session 2:

Chpt. 8 – Enzymes as Catalysts

Chpt. 9 – Regulation of Enzymes

Week 2: Cellular Communication

Course Objectives – 1,4 – At the end of this week the learner will:

- be able to explain how cells communicate and integrate signals resulting in a cellular or physiological change.

Chapters:

Chpt. 10 – Relationship between cell biology and biochemistry

Chpt. 11 – Cell Signaling by Chemical Messengers

Week 3: Central Dogma – DNA structure and synthesis

Course Objectives – 1,2,3,4,5,6 – At the end of this week the learner will:

- be able to describe the structure and synthesis of nucleotides.
- be able to relate the phases of the cell cycle to DNA replication and repair processes.

Chapters:

Session 1:

Chpt. 12 – Nucleotide structure

Chpt. 41 – Purine and Pyrimidine Synthesis and Salvage

Session 2:

Chpt. 13 – DNA Synthesis

Week 4: Central Dogma – Transcription and Translation

Course Objectives – 1,5 – At the end of this week the learner will:

- be able to describe the flow of genetic information from DNA to the level of protein synthesis.

Chapters:

Chpt. 14 – Transcription

Chpt. 15 – Translation

Week 5: Gene regulation and diagnostic evaluation

Course Objectives – 1,3,6 – At the end of this week the learner will:

- be able to integrate information from previous weeks and illustrate how cells sense and regulate gene expression.
- be able to understand how to evaluate these changes at a molecular level using cutting edge molecular technologies.

Chapters:

Session 1:

Chpt. 16 – Regulation of Gene expression

Session 2:

Chpt. 17 – Use of Recombinant DNA Techniques in Medicine

Week 6: Amino acids as specialized products

Course Objectives – 1,6,7 – At the end of this week the learner will:

- able to evaluate how defects in amino acid metabolism are inherited and how accumulation of intermediary metabolites can be used to clinically diagnose these disorders.

Chapters:

Chpt. 39 – Synthesis and degradation of amino acids

Chpt. 40 – Tetrahydrofolate, Vitamin B12, and S-Adenosylmethionine

Unit 2 – Generation of Energy and Carbohydrate Metabolism**Week 7: Generation of energy**

Course Objectives – 2,7 – At the end of this week the learner will:

- be able to relate the free energy of a reaction with its directionality.
- be able to describe the relevance and generation of ATP within the cell.

Chapters:

Chpt. 19 – Cellular Bioenergetics

Chpt. 21 – Oxidation phosphorylation

Week 8: Carbohydrate Metabolism

Course Objectives – 1,2 – At the end of this week the learner will:

- be able to summarize carbohydrate, fat and amino acid metabolism and the interrelationship of various tissues.
- be able to assess the metabolic fate of carbohydrates following digestion.

Chapters:

Session 1:

Chpt. 26 – Basic concepts in the regulation of Fuel metabolism by insulin, glucagon and other hormones

Session 2:

Chpt. 27 – Digestion, absorption and transport of carbohydrates

Chpt. 22 – Generation of ATP from Glucose: Glycolysis

Chpt. 28 – Formation and Degradation of Glycogen

Week 9: TCA cycle

Course Objectives – 1,2 – At the end of this week the learner will:

- be able to describe the role and regulation of the TCA cycle in generating reducing equivalents and substrates for intermediary metabolism.

Chapters:

Chpt. 20 – Tricarboxylic Acid Cycle

Week 10: Alternative glucose metabolism and the RBC

Course Objectives – 1,2 – At the end of this week the learner will:

- be able to discuss alternative pathways for glucose metabolism; specifically glucose metabolism within the red blood cell and the necessity of NADPH.

Chapters:

Chpt. 29 – Pathways of Sugar metabolism: Pentose Phosphate Pathway, Fructose

Unit 3 – Lipid metabolism and integrated metabolism

Week 11: Digestion, circulation and synthesis of lipids

Course Objectives – 1,2 – At the end of this week the learner will:

- be able to illustrate how lipids are digested and transported to the periphery and synthesized.
- be able to assess how these processes are hormonally regulated.

Chapters:

Session 1:

Chpt. 32 – Digestion and transport of Dietary Lipids

Session 2:

Chpt. 33 – Synthesis of Fatty acids, Triacylglycerols and Major Membrane Lipids

Week 12: Cholesterol synthesis and lipoprotein metabolism

Course Objectives – 1,2 – At the end of this week the learner will:

- be able to interpret the circulation of both dietary and endogenous cholesterol.

- be able to determine how this impacts de novo cholesterol synthesis.
- be able to determine the interrelationship VLDL and HDL metabolism.

Chapters:

Chpt. 34 – Cholesterol absorption, synthesis and metabolism

Week 13: Maintenance of blood glucose

Course Objectives – 1,2 – At the end of this week the learner will:

- be able to describe the necessity and hormonal regulation of gluconeogenesis and the maintenance of blood glucose.

Chapters:

Session 1:

Chpt. 31 – Gluconeogenesis and Maintenance of Blood Glucose

Chpt. 33 – Synthesis of Fatty acids, Triacylglycerols and Major Membrane Lipids

Session 2:

Chpt. 25 – Metabolism of Ethanol

Unit 4 – Hormonal control of metabolism and metabolic acidosis

Week 14: Protein digestion and the urea cycle

Course Objectives – 1,2,3,6 – At the end of this week the learner will:

- be able to assess the amino acid pool within the body.
- be able to determine the relative flux thru the urea cycle based on protein catabolism.

Chapters:

Chpt. 37 – Protein Digestion and Amino Acid Absorption

Chpt. 38 – Fate of Amino Acid Nitrogen: Urea cycle

Week 15: Fasted state and Metabolic Acidosis

Course Objectives – 1,2,3,6 – At the end of this week the learner will:

- be able to determine metabolic adaptations that occur during the fasting state
- be able to confidently revisit the integration of intermediary metabolism within the liver, brain, kidney, skeletal muscle and adipose.

Chapters:

Chpt. 3 – Fasting

Chpt. 36 – Integration of carbohydrate and Lipid metabolism

Chpt. 42 – Interrelationships of Amino acids with other tissues

Week 16: Additional hormones that impact metabolism

Course Objectives – 2,3 – At the end of this week the learner will:

- be able to integrate the actions of alternative hormones on the discussed metabolic pathways to facilitate integration of metabolism across tissues.

Chapters:

Chpt. 43 – Actions of Hormones that Regulate Fuel Metabolism

Student Resources

Student Portal: Your Best UNE Resource

We created the UNE Online Student Portal, <http://success.une.edu>, specifically for you, to be a useful collection of information to support you as you navigate your online course(s).

From the [UNE Online Student Portal](http://success.une.edu), you can access:

- Blackboard
- Technical Support
- Library
- Bookstore
- UNE Email
- U-Online

The portal also features:

- Dates to Remember
- Support and Services
- Contact information for your Support Specialist
- Academic Resources - links to the Academic Calendar, Registrar and Academic Calendar
- Financial - links to eBilling, Financial Aid and Student Accounts

Accommodations

Any student who would like to request, or ask any questions regarding, academic adjustments or accommodations must contact Disability Services (207) 221-4418 or pcdisabilityservices@une.edu. Disability Services staff will evaluate the student's documentation and determine eligibility of accommodation(s) through the Disability Services registration procedure. It is the students' responsibility to communicate any approved accommodations to their faculty.

Policies

Proctored Examinations

The University of New England has contracted with ProctorU to provide students with the most convenient online exam proctoring system. This system provides a simple, no cost to the student, secure, online proctor for all exams and allows the student to take all of the exams at home and on their own schedule.

Upon enrollment into the course, each student will register with ProctorU and establish a login name and password. This

will give you access to all of ProctorU's services. When ready, students will schedule each of their proctored exams with ProctorU at least 72 hours prior to taking that exam. Upon the exam day and hour, students will log in to proctor U and click on "exams". Additionally, be sure that your testing site's connection meets the minimum requirements by using ProctorU's ["Test It Out" utility](#). Following the procedures outlined at ProctorU's web site, the student will log in to Blackboard, open the appropriate exam and the proctor will then allow student access to that exam.

System Requirements

All of the science prerequisites offered at UNE are based online. In order for you as a student to have the best experience possible, UNE has established some technical specifications for you. These technical requirements are inclusive of ProctorU's technical requirements.

- Mac Operating System - OSX 10.7.3
- Windows Operating System - Microsoft Windows XP
- Processor
 - 2.4 GHz Intel Core 2 Duo
- Memory - 2 GB
- Hard Drive - 4 GB Free Space
- Web Browsers Supported
 - Google Chrome (for Mac and Windows), Safari (for Mac)
- Other Requirements
 - Access to a computer and internet without atypical security settings. See if your connection meets these requirements with ProctorU's [equipment check report card](#).
 - Internet speed: 1.5 Mbs upload & download required, with basic broadband (4 Mbs) recommended
 - Webcam - 1280×720 (1 megapixel) resolution recommended
 - Microphone
 - Internal or external DVD drive
 - Java 7

Not supported at this time:

- Mobile devices and mobile operating systems
- Linux based operating systems, Chromebooks

Computer Proficiency Requirements

- You will need basic computer literacy to participate comfortably in an online course environment. Please see the [Computer Proficiency Requirements](#) page for complete details.

Course Length

A schedule of lectures and assignments is included in this syllabus. This is, however a self-paced course and you can complete the course in less time.

1. Courses in SPHP program are equivalent to one-semester courses designed to be completed in 16 weeks
2. Enrollment in the course begins the day your section opens which is listed in the Academic Calendar found on the Student Success Portal.
3. Course start and end dates are in respect to Eastern Standard Time.
4. Students for whom a grade has not been posted by week 14 will be flagged by the administrative staff.

Withdrawal and Refund Policies

Please visit [this page](#) to review the withdrawal and refund policies.

Incomplete Grade Policy

Students are expected to complete all course work by the end date of the course. To view the incomplete grade policy [please click here](#).

Transcripts

Due to the Family Educational Rights and Privacy Act, only the student may request official transcripts. This may be done online by going to the University of New England Registrar website and following the directions on the page.

To view your unofficial UNE student transcript:

1. Log into uonline at <http://uonline.une.edu>
2. Select Student Services
3. Select Student Records
4. Select Academic Transcript

To request your official UNE student transcript:

Please review your Unofficial Transcript prior to requesting an Official Transcript.

1. Log into uonline at <http://uonline.une.edu>
2. Select Student Services
3. Select Student Records
4. Select Request Printed/Official Transcript
5. Follow the prompts

After you click Submit Request, your official transcript will be put into the queue to be printed in the Registrar's Office.

Academic Integrity

The University of New England values academic integrity in all aspects of the educational experience. Academic dishonesty in any form undermines this standard and devalues the original contributions of others. It is the responsibility of all members of the University community to actively uphold the integrity of the academy; failure to act, for any reason, is not acceptable.

Academic dishonesty includes, but is not limited to the following:

1. Cheating, copying, or the offering or receiving of unauthorized assistance or information.
2. Fabrication or falsification of data, results, or sources for papers or reports.
3. Action which destroys or alters the work of another student.
4. Multiple submission of the same paper or report for assignments in more than one course without permission of each instructor.
5. Plagiarism, the appropriation of records, research, materials, ideas, or the language of other persons or writers and the submission of them as one's own.

Charges of academic dishonesty will be reviewed by the Program Manager. Penalties for students found responsible for violations may depend upon the seriousness and circumstances of the violation, the degree of premeditation involved, and/or the student's previous record of violations. Appeal of a decision may be made to the Dean whose decision will be final. Student appeals will take place through the grievance process outlined in the student handbook.