

Biochemistry 385 – Metabolic Biochemistry
Arizona Online – Fall 2026

Description of the Course

Fundamentals of metabolism at the cellular and organismal levels, with a focus on regulatory mechanisms that control metabolic flux. Topics include metabolic flux through energy converting pathways, metabolism of carbohydrates, lipids, amino acids, and nucleotides. This course is designed for undergraduate students with majors in any of the STEM fields, as well as pre-professional health science students with liberal arts majors who have taken the necessary prerequisite courses. Bioc 385 is the companion course to Bioc 384 "Foundations in Biochemistry." Note that since the same textbook is used for both courses, it is possible to take them out of sequence by referring to material in the book.

Bioc 384/385 Course Prerequisites: CHEM 142/144 (General Chemistry), CHEM 241A (Organic Chemistry), and MCB 181R (General Biology) - and all prerequisites for these listed courses. Note that credit can be earned in Bioc 384 or Bioc 462A, but not both, similarly Bioc 385 or Bioc 462B.

Bioc 385 Course Objectives: *The following topics will be covered in this course:*

1. Metabolic flux and have foundational understanding of metabolic regulation.
2. Carbohydrate degradation/biosynthetic pathways and regulation of carbohydrate metabolism.
3. Lipid degradation and biosynthetic pathways and regulation of lipid metabolism.
4. Amino acid degradation and biosynthetic pathways and regulation of amino acid metabolism.
5. Nucleotide degradation and biosynthetic pathways and regulation of nucleotide metabolism.
6. Relationships between metabolic pathways and physiological responses to hormones.
7. Structure-function relationships of DNA, RNA, and protein modifying proteins.

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

1. Articulate core principles of seven major metabolic pathways with regard to a) the function of the pathway in cells, b) the net reaction of the pathway, c) the key regulated enzymes in the pathway, and d) an example of everyday biochemistry in which the pathway is essential.
2. Articulate the biochemical basis for DNA replication, DNA repair, and DNA recombination with regard to the major enzymes and their functions.
3. Describe in detail a) how RNA synthesis differs between prokaryotes and eukaryotes, b) the processes required for mRNA maturation in eukaryotes, and c) RNA interference.
4. Describe in detail a) how the Genetic Code was discovered and by whom, b) the essential steps in protein synthesis, and c) examples of three types of antibiotics.
5. Describe in detail a) how gene regulation differs between prokaryotes and eukaryotes and why this matters, b) specific components of the *lac* and *trp* operons and how the operons are regulated in response to metabolite availability, and c) basis of induced pluripotency.

Course web site on D2L

Information about lectures, homework, exams, grades, and all other aspects of this course are available on the D2L course web site. The information contained in this course syllabus, other than the grade and absence policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructors. Any changes will be announced on the course web site. It is the responsibility of each student to check the course web site.

Instructor: Dr. Roger L Miesfeld: rlm@arizona.edu

Zoom Office Hours; Wed/Fri at 11:00am (AZ Time) Zoom link in D2L Content bar

Grad Teaching Assistant: Nathan Weintraub: nweintraub@arizona.edu

Zoom Office Hours: TBD

Land Acknowledgement

We respectfully acknowledge the University of Arizona is on the land and territories of Indigenous peoples. Today, Arizona is home to 22 federally recognized tribes, with Tucson being home to the O'odham and the Yaqui. Committed to diversity and inclusion, the University strives to build sustainable relationships with sovereign Native Nations and Indigenous communities through education offerings, partnerships, and community service. The University of Arizona resides on ancestral lands of the Tohono O'odham nation, where many today continuously reside in their ancestral land. We acknowledge the privilege it is to teach and learn in this region and we express our gratitude to the nation.

Textbook: Miesfeld & McEvoy *Biochemistry* (WW Norton, 2nd Edition, July 2021, magenta cover) is made available as an E-book with all e-media ancillaries including the required online graded homework (SmartWork5) at a discount through the UA Bookstore **Inclusive Access** program. An unbound **print copy** of the textbook (loose leaf) is available for **\$40 – if you keep the Inclusive Access license** and contact the UA Bookstore by email **after the OPT OUT deadline** to reserve a print copy:
digitaltext@arizona.edu.

If you have your own print copy, you will need to purchase a license for the SmartWork online homework at a cost of ~\$55 from the publisher. You can purchase the SmartWork package at <https://digital.wwnorton.com/biochem2> (choose “purchase options” upper corner). **Information about the UA Inclusive Access Program and process you need to follow to OPT OUT:**
<https://shop.arizona.edu/textbooks/Inclusive.asp> Do NOT sign up for the “21-day free trial” through the publisher website - everything is through D2L.

Note that this textbook was chosen because it was specifically developed for majors with an interest in the health professions or environmental studies. Royalties in excess of \$500 that are received by RLM from textbook sales to UA students in this class will be donated to the College of Science Galileo Circle for the awarding of undergraduate student scholarships:
<https://cos.arizona.edu/content/galileo-circle-scholars>.

Lecture Videos: This course is organized in a hybrid format containing 12 content modules divided into six topics (mini lectures) per module. There are four midterm exams each of which covers the content in three modules, e.g., Exam 1 covers Modules 1, 2, and 3, Exam 2 covers Modules 4, 5, and 6, etc.. Since each topic is presented by Professor Miesfeld in a short video, there are a total of 72 lecture topics (and videos) that cover the entire course. The lecture videos of ~16-20 minutes each are available asynchronously and were produced in the UArizona film studios using professional editing equipment.

All 72 lecture videos are open throughout the course and you can view them as many times as you wish with full playback control (pause, rewind, fast-forward). Importantly, each lecture video is accompanied by a PPT deck in PDF file format for taking notes while watching the videos. All PPT decks contain a “Big Picture” introductory slide, ~10-14 content slides, and a concluding “Key Concepts” slide to help guide your learning. This PPT deck is the same one used in the videos. You will need to watch the six videos covering each module *before* the course moves on to the next module; plan on six videos per week.

Student Assessment: Homework, Quizzes, Discussions, and Exams

There are **4 Midterm Exams** worth 250 points each and an optional **Final Exam** also worth 250 pts. Only the top four scores of these five exams are counted for a maximum of **1000 points**. The midterm exams and final exam are 90 minutes and consist of 25 multiple choice questions (10 pts each) drawn randomly from a pool of ~120 questions. Questions in the RLM Midterm Exam Library are proprietary and unavailable to students.

The exams are proctored by Honorlock (the Honorlock link is in the D2L navigation bar). The exams are open for scheduling for 60 hours from **11am on Day 1** (AZ time) until **11pm on Day 3** (AZ time). As long as you begin the exam before the 11pm (AZ time) deadline on Day 3, you will have the full 90 minutes to complete the exam without penalty. The optional **Final Exam** is based on a set of 250 multiple choice review questions taken from the Norton Publishing Test Bank, which will be posted on D2L one week before the final exam (posted in the Quizzes tab on D2L). Answers to all 250 questions are provided using the submission view. The Final Exam is not required and can be a dropped exam.

There are 12 **D2L Quizzes** (D2Qs) worth 15 pts each with three submission attempts and are open book, open notes, open internet, open AI, group study, etc. Only the top 10 scores will be counted to give a total of **150 pts**. In addition, there are 12 **SmartWork (SW) Assignments** each worth 15 points with *three submission attempts* for each question. Only the top 10 scores are counted for **150 pts**.

There are **12 Discussion Assignments** worth 10 pts each. Only the top 10 scores will be counted to give a total of **100 pts**. Discussions consists of answering all of the instructor questions *in your own words*, pose a follow-up question and describe why you thought a peer question was good.

Total of **1400 pts** with 1000 pts earned from exams and 400 pts from the quizzes and discussions.

Guaranteed minimum cutoffs:

1253 total pts. (89.5%) for an "A" grade
1113 total pts. (79.5%) for a "B" grade
903 total pts. (64.5%) for a "C" grade
623 total pts. (44.5%) for a "D" grade
<623 total pts. (<44.5 %) for a "E" grade

A grade of **Incomplete** is very rare and can only be obtained at the end of the semester when all but a very minor portion of the course work needs to be completed (<10%). The incomplete portion will need to be satisfied within TWO weeks of the end of the course (*not one year*). In all other hardship cases, the student will need a **Withdrawal** from the course or earn a final grade and repeat the course later using the **GRO**. Registrar's Office: <https://registrar.arizona.edu/dates-and-deadlines>

D2Q quizzes use a question library

format, which means that questions for these quizzes are pulled from the RLM D2Q quiz library at random. Since only the highest quiz score counts, it is advisable to use all three attempts to have access to as many questions in the pool as possible for use in exam preparation. There are ~35 *questions* in each pool, which are proprietary and unavailable to students.

Extra Credit Opportunities: 50 points are possible

1) This extra credit opportunity consists of visiting my everyday biochemistry website you will find at: <https://everydaybiochemistry.com/everyday-biochem/> and choosing one of the examples of Everyday Biochemistry derived from the 26 chapter openings in the 3rd Edition of *Miesfeld's Biochemistry*. You may **NOT** submit a **scan of a document in PDF format**; it must be readable by TurnItIn.com to receive a score. All files must be submitted in D2L before the deadline at 11:59pm.

2) If >60% of the students in the class complete the anonymous **UArizona Student Survey** at the end of the semester sent from the Provost office, then every student in the class will receive **5 points**.

The HONORLOCK proctoring service. In this course, you'll have the convenience of taking your exams remotely, supported by Honorlock (opens in a new tab) (<https://honorlock.com/home-c/>). To help you navigate the Honorlock process effortlessly, you will receive a Student Guide. To ensure a seamless testing experience, please have your CatCard or a government-issued ID ready for identity verification. Before initiating your exam, we recommend reviewing the system requirements and acquainting yourself with Honorlock's standard rules and expectations. There's no need to create an account or pre-schedule an appointment; Honorlock access is available 24/7 via D2L, ensuring flexibility in your testing schedule.

Note: *specific instructions for **Bioc 384.385 students** are posted in the D2L Content bar.*

Watch this video: <https://honorlock.kb.help/how-to-use-honorlock-student/>

System Requirements: *You will need a desktop or laptop with an operating system.*

- Windows 10+
- MacOSX 10.15 or ChromeOS 120+ and Google Chrome browser 120+
- Internet: >2 Mbps download and >1 Mbps upload (Hotspots not recommended)

NOTE: Tablets and iPads are not compatible Your device must have a webcam and microphone.

- Built-in or external devices are ok.
- Students will need to also have the following minimum requirement to test with Honorlock:
 - Desktop computer, laptop, or Chromebook (tablets and cell phones do not meet our requirements)
 - A working built-in or external webcam and microphone
 - Use of Google Chrome and disable pop-up blocker

NOTE: Honorlock is not compatible with Walmart Branded Camera (ONN) You will need stable internet connection speed. To check if your device meets minimum system requirements:

<https://prep.honorlock.com/system-check>

Honorlock's Standard Rules and Regulations

Testing Area

- Lighting in the room must be bright enough to show the student's face and the surrounding area in a clear and detailed manner. Students should be seated at a desk or table. Laying down in bed or elsewhere when taking the exam is not allowed.
- Students should clear their desk or table of all other materials (e.g., books, papers, notebooks, calculators, etc.)
- No visible writing on the desk or walls is permitted.
- All third-party programs and windows (websites, Excel, Word, etc.) on the testing computer must be closed before logging into the proctored test environment.
- Loud music, television, or other distractions playing in the background are prohibited.
- No other people or parties aside from the exam taker is permitted near the testing environment, and all communication between the exam taker and other people is prohibited.

Testing Behavior:

- Students must not leave the room during the testing period at any time or take the computer into another room without Honorlock's permission.
- No breaks will be permitted.
- Use of hats, hoodies, headsets, or earplugs is prohibited.
- **Having a cell phone or tablet in the room for use during the exam is strictly prohibited.**
- The student's face must remain within view of the camera at all times.
- Honorlock will not add more time for proctoring questions or technical issues during the exam.

For assistance, email support@honorlock.com or chat directly with support through the Live Chat feature on the [Honorlock dashboard](#).

Make-Up Exam Policy Students who know in advance that they will be unable to take an examination must contact the instructor to *request* an alternate time to take the exam. Depending on the justification, a make-up exam *may* be given. In the case of an emergency during the window of the scheduled class exam, the student must contact the instructor as soon as possible to make exam arrangements.

Accessibility and Accommodations: At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520-621-3268, <https://drc.arizona.edu>) to establish reasonable accommodations.

UA Nondiscrimination and Anti-harassment Policy The University is committed to creating and maintaining an environment free of discrimination;

<http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy>

Our classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.

Absence and Class Participation Policy The UA's policy concerning Class Attendance, Participation, and Administrative Drops is available at: <http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop> The UA policy regarding absences from exams for any sincerely held religious belief, observance or practice will be accommodated where reasonable, <http://policy.arizona.edu/human-resources/religious-accommodation-policy>. Absences from exams as pre-approved by the UA Dean of Students (or Dean Designee) will be honored. See: <https://deanofstudents.arizona.edu/absences>.

Code of Academic Integrity Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog.

See: <http://deanofstudents.arizona.edu/codeofacademicintegrity>
<http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity>.

The University Libraries have some excellent tips for avoiding plagiarism, available at <http://new.library.arizona.edu/research/citing/plagiarism>.

Selling class notes and/or other course materials to other students or to a third party for resale is not permitted without the instructor's express written consent. Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions. Additionally, students who use D2L or UA e-mail to sell or buy these copyrighted materials are subject to Code of Conduct Violations for misuse of student e-mail addresses. This conduct may constitute copyright infringement.

Classroom Behavior Policy To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.).

Safety on Campus and in the Classroom Policy For a list of emergency procedures for all types of incidents, please visit the website of the Critical Incident Response Team (CIRT): <https://cirt.arizona.edu/case-emergency/overview> . Also watch the video available at: https://arizona.sabacloud.com/Saba/Web_spf/NA7P1PRD161/common/learningeventdetail/crtfy000000000003560

Threatening Behavior Policy The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See <http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students>.

University-wide Policy links to the following UA policies are provided here, <http://catalog.arizona.edu/syllabus-policies>

Confidentiality of Student Records <http://www.registrar.arizona.edu/ferpa/default.htm>

Subject to Change Statement

Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor.

Biochemistry 385 – Metabolic Biochemistry

Module	Video	Lecture Title	Video Length	Textbook (2 nd Edition)
1 D2Q-01 SW-01	M1T1	<i>Bioenergetics of Coupled Reactions in Metabolism</i>	26:59	Section 2.1
	M1T2	<i>Amino Acids, Proteins, and Enzymes</i>	20:36	Sections: 4.1, 4.2, 7.1
	M1T3	<i>Metabolic Flux: Energy Conversion Pathways</i>	17:34	Sections: 9.1, 10.1, 11.2
	M1T4	<i>Plants Harvest Energy from Sunlight</i>	16:12	Chapter 12.1
	M1T5	<i>Energy Conversion: Photosystems I and II</i>	23:46	Chapter 12.2
	M1T6	<i>Photophosphorylation Generates ATP</i>	14:01	Chapter 12.3
2 D2Q-02 SW-02	M2T1	<i>Carbon Fixation by the Calvin-Benson Cycle</i>	24:13	Chapter 12.4
	M2T2	<i>Regulation of the Calvin-Benson Cycle by Light</i>	11:24	Chapter 12.4
	M2T3	<i>Photorespiration: Hatch-Slack and CAM Pathways</i>	19:12	Chapter 12.4
	M2T4	<i>Glycobiology: Study of Carbohydrate Structures</i>	18:26	Chapter 13.1
	M2T5	<i>Structure and Function of Carbohydrate Polymers</i>	16:22	Chapter 13.1
	M2T6	<i>Glycoconjugates and ABO Human Blood Types</i>	29:43	Chapter 13.2
3 D2Q-03 SW-03	M3T1	<i>β-Lactam Antibiotics Target Peptidoglycan Synthesis</i>	18:24	Chapter 13.2
	M3T2	<i>Pentose Phosphate Pathway: Enzymatic Reactions</i>	26:27	Chapter 14.1
	M3T3	<i>Glucose-6P Dehydrogenase Deficiency in Humans</i>	12:52	Chapter 14.1
	M3T4	<i>Gluconeogenesis Uses Non-Carbohydrate Sources</i>	14:23	Chapter 14.2
	M3T5	<i>Gluconeogenesis Bypasses the Glycolytic Pathway</i>	18:41	Chapter 14.2
	M3T6	<i>Regulation of Gluconeogenesis and the Cori Cycle</i>	14:50	Chapter 14.2
		EXAM 1 covers Modules 1-3 (18 topics)		
4 D2Q-04 SW-04	M4T1	<i>Glycogen Metabolism: Degradation</i>	25:55	Chapter 14.3
	M4T2	<i>Glycogen Metabolism: Synthesis</i>	11:17	Chapter 14.3
	M4T3	<i>Regulation of Glycogen Metabolism: Storage Diseases</i>	20:20	Chapter 14.3
	M4T4	<i>Structure and Chemical Properties of Fatty Acids</i>	22:23	Chapter 15.1
	M4T5	<i>Structure and Function of Waxes and Triacylglycerols</i>	17:32	Chapter 15.1
	M4T6	<i>Absorption and Metabolism of Dietary Triacylglycerols</i>	14:19	Chapter 15.2

Module	Video	Lecture Title	Video Length	Textbook (2 nd Edition)
5	M5T1	<i>Triacylglycerol Metabolism in Liver and Adipose Tissue</i>	11:12	Chapter 15.2
D2Q-05 SW-05	M5T2	<i>Cell Membranes Contain Three Major Lipids</i>	17:15	Chapter 15.3
	M5T3	<i>Cholesterol Derivatives Regulate Nuclear Receptors</i>	20:07	Chapter 15.4
	M5T4	<i>Eicosanoid Hormones are Derived from Arachidonate</i>	16:15	Chapter 15.4
	M5T5	<i>The Fatty Acid β-Oxidation Pathway in Mitochondria</i>	25:41	Chapter 16.1
	M5T6	<i>Ketogenesis is a Salvage Pathway for Acetyl-CoA</i>	18:44	Chapter 16.1
6	M6T1	<i>Fatty Acid Synthase is a Multifunctional Enzyme</i>	25:10	Chapter 16.2
	M6T2	<i>Regulation of Fatty Acid Synthesis</i>	14:45	Chapter 16.2
	M6T3	<i>Cholesterol is Synthesized from Acetyl-CoA</i>	14:16	Chapter 16.3
	M6T4	<i>Cholesterol Metabolism and Cardiovascular Disease</i>	31:26	Chapter 16.3
	M6T5	<i>Nitrogen Fixation and Assimilation in Plants</i>	28:11	Chapter 17.1
	M6T6	<i>Glutamine Synthetase and Aminotransferase Enzymes</i>	19:54	Chapter 17.1
		EXAM 2 covers Modules 4-6 (18 topics)		
7	M7T1	<i>Degradation of Dietary and Cellular Proteins</i>	16:06	Chapter 17.2
	M7T2	<i>The Urea Cycle Removes Ammonia from the Body</i>	24:38	Chapter 17.2
	M7T3	<i>Degradation of Glucogenic and Ketogenic Amino Acids</i>	21:27	Chapter 17.2
	M7T4	<i>Synthesis of Essential and Nonessential Amino Acids</i>	24:04	Chapter 17.3
	M7T5	<i>Heme Metabolism: Biosynthesis and Degradation</i>	16:16	Chapter 17.4
	M7T6	<i>Synthesis of Tyrosine and Arginine Metabolites</i>	22:15	Chapter 17.4
8	M8T1	<i>Structure and Function of Nucleotides</i>	10:30	Chapter 18.1
	M8T2	<i>The Purine Biosynthetic Pathway</i>	18:48	Chapter 18.2
	M8T3	<i>Defects in Purine Metabolism</i>	16:54	Chapter 18.2
	M8T4	<i>Pyrimidine Metabolism and Degradation</i>	16:09	Chapter 18.3
	M8T5	<i>Structure and Function of Ribonucleotide Reductase</i>	17:15	Chapter 18.4
	M8T6	<i>Thymine Deoxyribonucleotides and Anticancer Drugs</i>	20:38	Chapter 18.4
9	M9T1	<i>Metabolic Integration at the Physiologic Level</i>	25:15	Chapter 19.1

Module	Video	Lecture Title	Video Length	Textbook (2 nd Edition)
	M9T2	<i>Insulin and Glucagon Control Glucose Homeostasis</i>	19:35	<i>Chapter 19.1</i>
	M9T3	<i>Control of Energy Balance by Hormone Signaling</i>	30:26	<i>Chapter 19.2</i>
D2Q-09 SW-09	M9T4	<i>The Metabolic Link Between Obesity and Diabetes</i>	17:55	<i>Chapter 19.2</i>
	M9T5	<i>Biochemistry of Macronutrition and Dieting</i>	14:17	<i>Chapter 19.3</i>
	M9T6	<i>Metabolic Effects of Exercise: AMPK Signaling</i>	17:56	<i>Chapter 19.3</i>
		EXAM 3 covers Modules 7-9 (18 topics)		
10 D2Q-10 SW-10	M10T1	<i>Structure and Function of DNA Replication Proteins</i>	21:57	<i>Chapter 20.1</i>
	M10T2	<i>Initiation and Termination of DNA Replication</i>	14:47	<i>Chapter 20.1</i>
	M10T3	<i>Causes and Consequences of DNA Damage</i>	26:56	<i>Chapter 20.2</i>
	M10T4	<i>Biochemistry of DNA Repair Mechanisms</i>	18:34	<i>Chapter 20.2</i>
	M10T5	<i>Mechanisms of DNA Recombination</i>	16:46	<i>Chapter 20.3</i>
	M10T6	<i>Structure and Function of RNA</i>	13:49	<i>Chapter 21.1</i>
11 D2Q-11 SW-11	M11T1	<i>Biochemistry of RNA Synthesis</i>	22:36	<i>Chapter 21.2</i>
	M11T2	<i>Mechanisms of Eukaryotic RNA Processing</i>	32:42	<i>Chapter 21.3</i>
	M11T3	<i>RNA-Mediated Gene Silencing</i>	13:12	<i>Chapter 21.4</i>
	M11T4	<i>Deciphering the Genetic Code: Biochemical Approaches</i>	17:49	<i>Chapter 22.1</i>
	M11T5	<i>Transfer RNA Synthetases: The Second Genetic Code</i>	10:43	<i>Chapter 22.2</i>
	M11T6	<i>Biochemistry of Protein Synthesis and Termination</i>	27:56	<i>Chapter 22.2</i>
12 D2Q-12 SW-12	M12T1	<i>Post-translational Modification of Proteins</i>	14:09	<i>Chapter 22.3</i>
	M12T2	<i>Molecular Mechanisms of Gene Regulation</i>	15:52	<i>Chapter 23.1</i>
	M12T3	<i>Prokaryotic Gene Regulation: lac operon</i>	9:06	<i>Chapter 23.2</i>
	M12T4	<i>Prokaryotic Gene Regulation: SOS and trp operons</i>	14:44	<i>Chapter 23.2</i>
	M12T5	<i>Eukaryotic Gene Regulation: Chromatin Modifications</i>	16:04	<i>Chapter 23.3</i>
	M12T6	<i>Reprogramming Gene Expression: Induced Pluripotency</i>	15:26	<i>Chapter 23.3</i>
		EXAM 4 covers Modules 10-12 (18 topics)		
			ONLINE - FINAL EXAM: Based on a Set of 250 Questions (Final Exam Question Set is available in the D2L Quiz tab)	