

## Chemistry 315 – Biochemistry (WIC)

<b><u>Lecture:</u></b>	<b>M &amp; W</b>	<b>12:15 – 1:30 PM</b>	<b>Room L.76 NB</b>
<b>Sec. 01</b>	<b><u>Lab:</u> W</b>	<b>2:50 – 5:30 PM</b>	<b><u>Rec:</u> W 5:40 – 6:55 PM 04.61.00 NB</b>
<b>Sec. 02</b>	<b>TH</b>	<b>2:50 – 5:30 PM</b>	<b>TH 5:40 – 6:55 PM 04.61.00 NB</b>
<b>Sec. 03</b>	<b>F</b>	<b>9:25 – 12:05 PM</b>	<b>F 12:15 – 1:30 PM 04.61.00 NB</b>
<b>Sec. 04</b>	<b>F</b>	<b>2:50 – 5:40 PM</b>	<b>F 5:40 – 6:55 PM 04.61.00 NB</b>

**Professor:** Dr. Artem V. Domashevskiy  
Office: 05.66.25 NB  
Phone: (646) 557- 4640  
Email: [adomashevskiy@jjay.cuny.edu](mailto:adomashevskiy@jjay.cuny.edu)

### LABORATORY INSTRUCTORS:

**Samantha Iverson (Sec. 01 & 04)**  
Phone: (646) 557- 4640  
Email: [samanthamiverson@gmail.com](mailto:samanthamiverson@gmail.com)

**Shari Maltz (Sec. 02 & 03)**  
Phone: (646) 557- 4640  
Email: [sharimaltz@gmail.com](mailto:sharimaltz@gmail.com)

**Office Hours: Mondays & Wednesdays, or by appointment.**

### COURSE DESCRIPTION

This is an introductory course to Biochemistry. It consists of Lecture (50% of the course grade), Laboratory (40% of the course grade) and Recitation components. Attendance to the Math & Science Center and to the Writing Center is required, and includes 10% of the course grade. Material covered in this course includes structures, properties and functions of biomolecules, including sugars, fats, amino acids, nucleotides, proteins, biomembranes and nucleic acids. Topics also include enzyme kinetics and mechanisms, metabolic pathways, and mechanisms regulating metabolism and gene expression. Laboratory topics include column chromatography, polyacrylamide gel electrophoresis, spectrophotometry, amino acids and buffers, enzyme kinetics and inhibitors, bioinformatics, DNA subcloning & transformation and others. Lab reports are required to be presented in the comprehensive journal article format. Recitation is for the lab component.

**YOU WILL NEED A GRADE OF 60 – IN BOTH LEC & LAB –  
OR BETTER TO PASS THIS CLASS!**

1. **Lecture Component (50 percent of your grade).**
2. **Laboratory Component (40 percent of your grade).**
  - a) See “Guidelines for Writing.....” for details on what to include in each laboratory report.
  - b) Lab report grades will incorporate peer-grading and self-check-listing, in addition to instructor grading. This will promote critical thinking about the content of your own report and will facilitate the completion of your Final-check list.
3. **Tutoring & Writing Workshops (10 percent of your grade).**
  - a) Points are achieved by attending 1 tutoring session AND 1 writing workshop in the time before each exam for a TOTAL of 4 tutoring and 4 writing sessions for the semester.
  - b) Don’t put these off or you may not be able to get in for appointments “on demand”.
  - c) **YOU MUST ATTEND ALL 8 SESSIONS IN ORDER TO RECEIVE THIS CREDIT!**
4. **Homework (see “Homework Assignments” at the end of this document for details).**

**This schedule for this syllabus is somewhat subject to change or re-arrangement. This is because some topics may take less time than scheduled, and some may take more.**

**There will be three mid-term exams and one final exam. All four exams are equally weighted.**

**The final exam is cumulative of all of the material for the course.**

Course Syllabi, Course Information, Course Documents, etc. are regularly updated on Blackboard. **You** are responsible for checking for new documents twice a week **and** after announcements to do so.

**Be prepared for lectures. This means reading the chapter before class.**

**Grading scale:**

- You will need a grade of 60 – overall or better to pass this class.
- AND
- You must have a grade of 60 on the LC to pass this class.
  - You must attend ALL EIGHT Tutoring / Writing Workshop sessions in order to receive 10% credit (Four of each & one of each before each exam).  
**THIS IS ALL OR NOTHING CREDIT!**

You should also note that for many types of internships, the minimum GPA requirement for Forensic Science majors has been clearly set at 3.0 (NYPD Crime Lab for example).

## **PRE-REQUISITES:**

Pre-requisites:

- English 102 or English 201 **AND** Math 241-242
- Biology 103-104 **AND** Physics 203-204
- Chemistry 201-202 **AND** Chemistry 220

Calculus (Math 241-242), Quantitative Analysis (Chemistry 220), and Physics (Physics 203-204) are of the utmost importance to mastering this material. (Physical Chemistry is a plus.)

## **LEARNING OUTCOMES:**

### *Reasoning*

- Translate precise chemical, thermodynamic, and kinetic reactions to life processes.
- Synthesize chemical and physical knowledge and understand the applications to dynamic biochemical problems.
- Apply physical and chemical protocols to troubleshoot and problem solve thought and physical experiments.
- Recognize the importance of impartial interpretation of data and accuracy of reporting findings.

### *Knowledge*

- Distinguish features of living organisms:
  1. High degree of chemical complexity and microscopic organization
  2. Means of extracting, transforming, and using energy from surroundings
  3. Mechanisms for sensing and responding to environmental change
  4. Capacity for precise self-replication and self-assembly
  5. Capacity for evolution
- Apply the chemical and physical laws and properties to biomolecules and living organisms.
- Describe how collections of inanimate molecules interact to form living organisms that maintain and perpetuate life

### *Practical skills*

- Describe modern biochemical laboratory protocols in a series of skills building experiments with the goal of synthesizing learned techniques in a final mature real-life biochemistry experimental analysis of enzyme mechanism.
- Recognize the importance of controls in experiments and precision in measurement.

### *Communication*

- Write laboratory reports in peer-reviewed manuscript form in this course.

## **PLAGIARISM**

### **Statement of College Policy on Plagiarism**<sup>1</sup>

Plagiarism is the presentation of someone else's ideas, words, or artistic, Scientific, or technical work as one's own creation. Using the ideas or work of another is permissible only when the original author is identified. Paraphrasing and summarizing, as well as direct quotations, require citations to the original source.

Plagiarism may be intentional or unintentional. Lack of dishonest intent does not necessarily absolve a student of responsibility for plagiarism.

It is the student's responsibility to recognize the difference between statements that are common knowledge (which do not require documentation) and restatements of the ideas of others. Paraphrase, summary, and direct quotation are acceptable forms of restatement, as long as the source is cited.

Students who are unsure how and when to provide documentation are advised to consult with their instructors. The Library has free guides designed to help students with problems of documentation.

#### **In this class:**

Academic dishonesty and plagiarism will result in penalties that are dependent on the severity of the misdeed. This may be anything from a zero on that lab or exam, zero in the course, dismissal from the entire course, or charges of academic dishonesty. Penalties will be directly applicable to the situation at hand. I would take this very seriously if I were you.

#### **Self Plagiarism:**

**If you are re-taking or re-doing any part of this course:**

- 1. You may not re-use or re-cycle any portion of your previous report except with the explicit permission of the instructor.**
- 2. You may NEVER "re-use" or "re-cycle" your data from previous laboratory experiments. This includes not only other student's data, but your own previously gathered data from earlier experimental work. Doing so will be considered plagiaristic.**

#### **In the laboratory class:**

Tampering with another's experiment will result in your immediate dismissal from the entire biochemistry course and academic charges will be filed.

#### **MISCELLANEOUS:**

Exam questions may be from lecture, the book, handouts, the study guide, homework, lab, etc. In other words, any source for this class is "fair game".

Use the Blackboard Discussion site for problem solving and peer discussion.

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<sup>1</sup> *John Jay College of Criminal Justice Undergraduate Bulletin*

### **Textbook List:**

*Lehninger's "Lecture Notes" (4<sup>th</sup> ed), are posted on Blackboard under "Assignments". These are by no means complete. See "Taking Lecture Notes (handout and Blackboard under "Assignments")*

- Lehninger, Principles of Biochemistry (5<sup>th</sup> ed.)  
Publisher: W.H. Freeman

Textbook + eBook package  
ISBN: 978 142 922 4161

OR

Loose Leaf Textbook (no eBook package)  
ISBN: 978 142 922 631

OR

Loose Leaf Textbook + eBook package  
ISBN: 142 922 5645

OR

eBook access card (alone)  
ISBN: 978 142 921 2427

- Stryer, Drug Development Chapter, Biochemistry (5<sup>th</sup> ed).  
Publisher: W.H. Freeman  
*Note: This chapter and its problem set will be a handout.*
- Laboratory Notebook  
Publisher: W.H. Freeman  
ISBN: 0-7167-3900-3

### Suggested texts:

- Lehninger, Principles of Biochemistry, (5<sup>th</sup> ed.) Study Guide.  
Publisher: W.H. Freeman  
ISBN: 978 142 921 2410  
*I have "mined" the study guide in the past for exam questions.*
- Strunk W., Jr., White E.B., (4<sup>th</sup> ed.) *The Elements of Style*. Longman, New York, 2000  
ISBN: 0-205-30902-X
- Stevenson, Ph.D., J., *The Pocket IDIOT'S Guide to Grammar & Punctuation*. Penguin Group, New York, 2005  
ISBN: 1-59257-393-2
- *Rhetoric, Research, and Strategies*, John Jay College of Criminal Justice Handbook.  
Pearson Custom Publishing, Boston, MA, 02116.

**Students who do not keep up with both reading and problem solving will have a very hard time passing this course.**

# Lecture Schedule

28 Lecture Classes

Class #	Lecture #	CHAPTER
1 01/28/13	1	Introduction and Foundations, (selected) Ch. 1 sections
2 01/30/13	2	Foundations, (selected) Ch. 1 sections
3 02/04/13	3	Water, Ch. 2
4 02/06/13	4	Water, Ch. 2
5 02/11/13	5	Amino Acids, Peptides, & Proteins, Ch. 3
6 02/13/13	6	Amino Acids, Peptides, & Proteins, Ch. 3
<b>02/18/13</b> <b>President's Day</b>	<b>College Is Closed</b> <b>No Class</b>	<b>College Is Closed</b> <b>No Class</b>
7 02/20/13	7 <b>Monday Schedule</b>	3-D Structure of Proteins, Ch. 4
<b>8</b> <b>02/25/13</b>	<b>EXAM DAY</b> <b>Monday</b>	<b>EXAM #1</b> <b>Ch. 1, 2, and 3</b>
9 02/27/13	8	3-D Structure of Proteins, Ch. 4
10 03/04/13	9	3-D Structure of Proteins, Ch. 4 & Protein Function, Ch. 5
11 03/06/13	10	Protein Function, Ch. 5
12 03/11/13	11	Protein Function, Ch. 5 & Enzymes, Ch. 6
13 03/13/13	12	Enzymes, Ch. 6
14 03/18/13	13	Enzymes, Ch. 6
<b>15</b> <b>03/20/13</b>	<b>EXAM DAY</b> <b>Wednesday</b>	<b>EXAM #2</b> <b>Ch. 4, 5, and 6</b>
→ <i>Independent Reading</i> → → <i>Independent Reading</i> →	→ <i>Independent Reading</i> → → <i>Independent Reading</i> →	<i>Carbohydrates &amp; Glycobiology,</i> <i>Ch. 7</i>
<b>03/25/13 – 04/02/13</b> <b>SPRING BREAK</b>	<b>03/25/13 – 04/02/13</b> <b>SPRING BREAK</b>	<b>03/25/13 – 04/02/13</b> <b>SPRING BREAK</b>
16 04/03/13	14	Nucleotides & Nucleic Acids, Ch. 8
17 04/08/13	15	Nucleotides & Nucleic Acids, Ch. 8

**THERE IS NO GRADING “CURVE” IN THIS COURSE**

18 04/10/13	16	Nucleotides & Nucleic Acids, Ch. 8 & DNA-Based Information Technology, Ch. 9
19 04/15/13	17	DNA-Based Information Technology, Ch. 9
20 04/17/13	18	DNA-Based Information Technology, Ch. 9
<b>21</b> <b>04/22/13</b>	<b>EXAM DAY</b> <b>Monday</b>	<b>EXAM #3</b> <b>Ch. 7, 8, and 9</b>
22 04/24/13	19	Lipids, Ch. 10
23 04/29/13	20	Lipids, Ch. 10
24 05/01/13	21	Membranes, Ch. 11
25 05/06/13	22	Membranes, Ch. 11
26 05/08/13	23	Membranes, Ch. 11 & Biosignaling, Ch. 12
27 05/13/13	24	Biosignaling, Ch. 12
28 05/15/13	25	Biosignaling, Ch. 12
<b>FINAL EXAM</b> <b>TBA</b>	<b>FINAL EXAM</b> 12:00-2:00 PM	<b>Final Exam</b> <b>Ch. 10, 11, and 12</b>

Be prepared for lectures. This means reading the chapter before class.  
Asking questions & in-class participation is strongly encouraged.

## Laboratory/Recitation Schedule

### 14 Laboratory/Recitation Classes

Class	Laboratory Experiment	Recitation
1	Use of Pipettes	Pipettes & Buffers
2	Preparation & Properties of Buffers	Amino Acid Titration
3	Amino Acid Titration	Gel Filtration Chromatography
4	Purification of a Mixture by Gel Filtration Chromatography	Spectrophotometry
5	Spectrophotometry	Isolation & Purification of Alkaline Phosphatase: Cell Lysis, Dialysis, Centrifugation, Heat Denaturation, & Salting-Out (Parts 1 & 2)
6	Isolation & Purification of Alkaline Phosphatase: Cell Lysis, Centrifugation, & Dialysis, Part 1	Peer-Review of Spectrophotometry
7	Isolation & Purification of Alkaline Phosphatase: Heat Denaturation, Salting-Out, & Dialysis, Part 2	Ion-Exchange Chromatography
8	Isolation & Purification of Alkaline Phosphatase: Ion-Exchange Chromatography, Part 3	SDS- & Native-PAGE
9	Isolation & Purification of Alkaline Phosphatase: SDS- & Native-PAGE, Part 4	Protein Quantification
10	Isolation & Purification of Alkaline Phosphatase: Protein Quantification, Part 5	Enzyme Kinetics
11	Isolation & Purification of Alkaline Phosphatase: Enzyme Kinetics, Part 6	Enzyme Inhibitors
12	Isolation & Purification of Alkaline Phosphatase: Enzyme Inhibitors, Part 7	$\alpha$ -Complementation
13	DNA Subcloning & <i>E. coli</i> Transformation: $\alpha$ -Complementation, Part 1	Bio-Informatics
14	DNA Subcloning & <i>E. coli</i> Transformation: $\alpha$ -Complementation, Part 2	Quiz



## **Rules and Guidelines for this class:**

*This may seem excessive to most of you. However, this list continues to grow with each semester according to need based on actual situations.*

- Attendance in all lectures and laboratories is required.
- ASK QUESTIONS.
- You will need a grade of 60 or better to pass this class AND a grade of 60 or better in the lecture portion.
- There is no “curve” grading for this course.
- You must attend all eight (four Tutoring & four Writing Workshop) sessions in order to receive 10% of the grade.
- Your GPA, probationary status, etc. are your responsibility alone and will have no influence whatsoever on how I will grade for you in this class.
- Do not be late for class. Information missed by you is not my responsibility, it is yours, and tardiness is unwise because you will miss things.
- Students who are more than 15 min late for labs will NOT be admitted.
- There are no scheduled make-up labs.
- There are no individual extra credit assignments. Any extra credit awarded in this class will be in the form of laboratory questions or extra exam questions. This will be available to everyone equally if offered at all.
- Penalties for academic dishonesty and plagiarism will result in penalties that are dependent on the misdeed. This may be anything from a zero on that lab or exam, zero in the course, dismissal from the entire course, or charges of academic dishonesty. Penalties will be directly applicable to the situation. Take this very seriously – I do.
- You and you alone are completely responsible for the material and information in the syllabus and the handouts (both in class and on Blackboard) regarding course requirements and expectations of you in executing them. I am not responsible in any way for making sure that you have read the material and information provided for you.
- You must remember to sign yourself in to the attendance book. If you forget to do so, that will be your error and your absence. The instructor will not independently do anything to verify your attendance in a class. A sign-in booklet or sheet will be made up as soon as I get the final roster.
- You must wear your goggles in the laboratory at all times. If you do not have goggles at the beginning of lab class, you will not be able to perform the lab and will be counted absent. If I have to ask you more than once to keep your goggles on, you must leave the lab and will be counted absent.
- DO NOT CHATTER WHEN THE INSTRUCTOR IS TALKING. Nothing can be more irritating to US and unproductive on YOUR part.
- Take good notes – read TAKING LECTURE NOTES (handout and Blackboard under “Assignments”). My notes handouts are not to be considered complete in any way.
- Last but not least, you will always be graded fairly. However, I do not compromise.
- Helpful hint: When I say a question will be on an exam, it usually is.

**MAKE CERTAIN THAT THE ABOVE INFORMATION IS CLEAR**

**THERE IS NO GRADING “CURVE” IN THIS COURSE**

## **What to do if you miss a laboratory**

### **Don't!**

There are no makeup labs.

There is not much you can do here. So my advice is to not miss any labs if at all possible. If you do, that lab is pretty much just gone for you.

The labs are frequently out of sync. This will make any catch up work pretty much impossible. Only when the labs are “in sync” is it possible (but not guaranteed) that you may attend another lab if necessary. Prior permission must be obtained before doing so. Permission to do so is not a right, it is a privilege.

### **Don't miss labs**

#### **Americans with Disabilities Act (ADA) Policies**

“Qualified students with disabilities will be provided reasonable academic accommodations if determined eligible by the Office of Accessibility Services (OAS). Prior to granting disability accommodations in this course, the instructor must receive written verification of a student’s eligibility from the OAS which is located at L66 in the new building (212-237-8031). It is the student’s responsibility to initiate contact with the office and to follow the established procedure for having the accommodation notice sent to the instructor.”

*Source:* Reasonable Accommodations: A Faculty Guide to Teaching College Students with Disabilities, 4<sup>th</sup> ed., City University of New York, p.3.  
([http://www.jjay.cuny.edu/studentlife/Reasonable\\_Accommodations.pdf](http://www.jjay.cuny.edu/studentlife/Reasonable_Accommodations.pdf))

**Grading scale (Undergraduate):** You will need a grade of 60 or better to pass this class. You should also note that for many internships, the minimum GPA requirement for Forensic Science majors has been clearly set at 3.0 (NYPD Crime Lab for example). Included also are registrar codes for final grade submission.

Letter Grade	Value	%	Explanation	_____	Letter Grade	Value	%	Explanation
A	4.0	93.0 - 100	Excellent		D+	1.3	67.1 - 69.9	Poor
A-	3.7	90.0 - 92.9	Excellent		D	1.0	63.0 - 67.0	Very Poor
B+	3.3	87.1 - 89.9	Very Good		D-	0.7	60.0 - 62.9	Very Poor
B	3.0	83.0 - 87.0	Very Good		F	0.0	00.0 - 59.9	Failure
B-	2.7	80.0 - 82.9	Very Good		P	.	-	Pass
C+	2.3	77.1 - 79.9	Satisfactory		W	.	-	Withdrawal
C	2.0	73.0 - 77.0	Satisfactory		WU	.	-	Unofficial W
C-	1.7	70.0 - 72.9	Poor		INC	.	-	Incomplete
					PEN	.	-	Pending

- **P -** Satisfactory completion of a graduate thesis course, graduate research equivalent, or undergraduate remedial or developmental courses.
- **INC- INCOMPLETE**  
Student for valid reason does not complete the work assigned (including final exams, papers etc.) and in your view has a reasonable chance to pass the course.
- **AU - AUDITOR**  
The student must have requested the status of auditor at the start of the semester. If a student in your course officially applied for auditor's status, a grade of "**AU**" will appear in the grade column. This grade cannot be assigned by the instructor.
- **W - OFFICIAL WITHDRAWAL**  
If a student in your course OFFICIALLY withdrew, a grade of "**W**" will appear in the grade column. .
- **R - Unsatisfactory completion of a remedial or developmental course**
- **PEN - Pending Investigation**  
Use the PEN grade when you suspect or determine that an academic integrity violation has taken place that warrants formal investigation. **Simultaneously** with entering a PEN grade you must file the "Faculty Report of Alleged Violation of Academic Integrity Policies" form with the College's Academic Integrity Officer (AIO). The Form can be downloaded here: <http://www.jjay.cuny.edu/disclaimer>
- **WU - UNOFFICIAL WITHDRAWAL**  
If a student stopped attending or has never attended your course and a pre-marked "**W**" does not appear in the grade column, a "**WU**" grade should be assigned. Equivalent to "**F**". Not valid for graduate students. You will be prompted for the last date the student attended

**THERE IS NO GRADING “CURVE” IN THIS COURSE**

## **Homework Assignments:**

Do as many as you can. These are not for handing in. These are for you to work on and judge your grasp of the material.

### *Notes:*

1. *The STUDY GUIDE: "Topics for discussion" is a particularly good way to ensure you understand the material.*
2. *Complete solutions are in the STUDY GUIDE – this is no substitute for you doing problems – scanning a solution is NOT learning.*
3. *I have "mined" the study guide in the past for exam questions.*
4. *A good STUDY INDEX is posted on Blackboard under "Assignments".*
5. *Use of alternate sources is always a plus for you.*
6. *Learn to "think outside the box" and not rely solely on the textbook's author for problems, this is key to mature learning.*

### **CHAPTER 1**

#### LECTURE SLIDES & TEXT

3, 6, 7, 9, 11

There are simply no good problems in the text

Use the STUDY GUIDE: "Topics for discussion", particularly for Physical Foundations, section 1.3.

*For chapter one, you simply **must** know section 1.3 inside-and-out. This is **memorization** plain and simple. A good way to study this chapter for the exam is to understand the*

### **CHAPTER 2**

#### LECTURE SLIDES & TEXT

All

Many of these are just "drills" and some are interesting "thought problems". DO

YOU KNOW THE FACTS (STUDY GUIDE)

1-12

APPLYING WHAT YOU KNOW (STUDY GUIDE)

1, 2, 4, 5, 6, 7

### **CHAPTER 3**

#### LECTURE SLIDES & TEXT

Know all of the amino acids, their classifications, general  $pK_a$ 's for the main functional groups and know the  $pK_a$ 's for the R-groups

1-5, 8, \*10, \*15, \*16

DO YOU KNOW THE FACTS (STUDY GUIDE)

1-10

APPLYING WHAT YOU KNOW (STUDY GUIDE)

1-9

CHAPTER 4

LECTURE SLIDES & TEXT

4, 6, 9

DO YOU KNOW THE FACTS (STUDY GUIDE)

1-13

APPLYING WHAT YOU KNOW (STUDY GUIDE)

1-3

CHAPTER 5

LECTURE SLIDES & TEXT

1-8

DO YOU KNOW THE FACTS (STUDY GUIDE)

1-11

APPLYING WHAT YOU KNOW (STUDY GUIDE)

1-3 (#4 assumes extra information about the # of epitopes on rabbit Ig)

CHAPTER 6

LECTURE SLIDES & TEXT

6-12, 16,18,19

13 & 17 for the mathematically inclined

DO YOU KNOW THE FACTS (STUDY GUIDE)

1-14, 16-22

APPLYING WHAT YOU KNOW (STUDY GUIDE)

1 & 2

CHAPTER 7

TEXT (SELF-STUDY)

None

DO YOU KNOW THE FACTS (STUDY GUIDE)

1, 2, 4, 10

APPLYING WHAT YOU KNOW (STUDY GUIDE)

1, 3

CHAPTER 8

LECTURE SLIDES & TEXT

1-3, 6-11

DO YOU KNOW THE FACTS (STUDY GUIDE)

1-14

APPLYING WHAT YOU KNOW (STUDY GUIDE)

1-3

HANDOUTS

CHAPTER 9

LECTURE SLIDES & TEXT

2, 5, 7, 8, 10, 11 i

DO YOU KNOW THE FACTS (STUDY GUIDE)

1-5

APPLYING WHAT YOU KNOW (STUDY GUIDE)

#1

HANDOUTS

CHAPTER 10

LECTURE SLIDES & TEXT

3-5, 8, 10, 11, 13

DO YOU KNOW THE FACTS (STUDY GUIDE)

1-9 (\* better than the text's problems)

APPLYING WHAT YOU KNOW (STUDY GUIDE)

1, 4, 5

*FOR THE MOST PART, THE LIPIDS CHAPTER IS THERE SO YOU CAN UNDERSTAND MEMBRANES*

CHAPTER 11

LECTURE SLIDES & TEXT

1-20

Many of these are good short answer-style

DO YOU KNOW THE FACTS (STUDY GUIDE)

1-16, \*18, 19, \*20

APPLYING WHAT YOU KNOW (STUDY GUIDE)

1-5

CHAPTER 12

LECTURE SLIDES & TEXT

2, 3, 5, 6, 11, \*15

DO YOU KNOW THE FACTS (STUDY GUIDE)

1-3, 5, 10, 12

APPLYING WHAT YOU KNOW (STUDY GUIDE)

2 & 3

*Everything studied in this semester contributes to your knowledge for this chapter*

***YOU SHOULD BE ABLE TO THINK  
"OUTSIDE THE BOX" FOR EXAM PROBLEMS***

*You should always be on the lookout for errors with problems and the accompanying solutions. Textbook editors are not infallible!*