Biochemistry 2EE3

Metabolism and Physiological Chemistry – ONLINE

Winter 2018

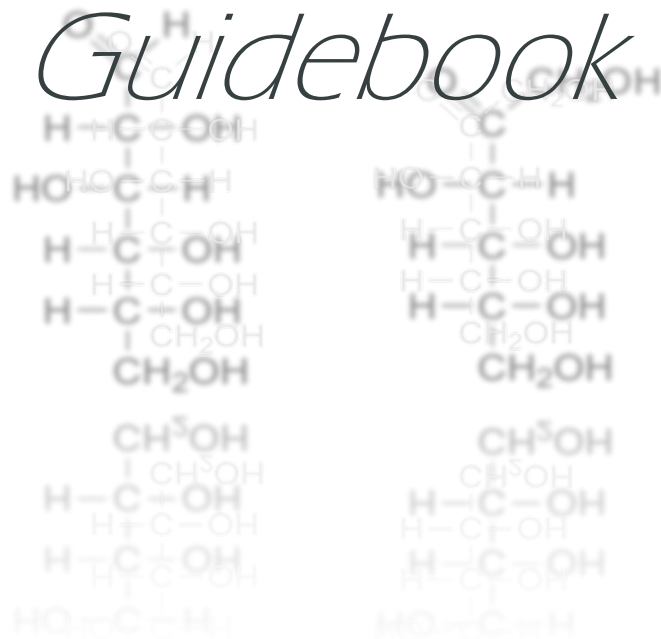*Guidebook*

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COURSE INTRODUCTION

Welcome to Biochemistry 2EE3. We are pleased to have you on board and together we will explore fundamental concepts in biochemistry. Biochemistry is everywhere you look: from disease to food to emotions. In this course, we will discuss many biochemical topics; from nucleic acids, to proteins, carbohydrates, lipids, enzymes and cells. We will also delve into the study of metabolism with pathways such as glycolysis, gluconeogenesis, the citric acid cycle and many more.

This course is conducted entirely online, with the exception of the final exam which is scheduled by the office of the registrar and is written in person. You will participate in the course using McMaster's learning management system called Avenue2Learn

http://avenue.mcmaster.ca

Announcements will be posted in A2L on a regular basis so please use this online portal as your source of news and a means of communicating with one another.

All assessments will be conducted using the Pearson "My Lab and Mastering Links" portal. Please note: this portal allows us access to Pearson-constructed assessment material, but we also design a large portion of the assessment ourselves.

Please make certain to check both A2L and Pearson-my lab sites regularly, as they will contain any important information about upcoming assignments and general class dialogue.

For all questions specific to course content, please email: bioc2ee3@mcmaster.ca

COURSE EXPECTATIONS

Academic Integrity

"Our assumption is that every student attending this course is doing so to genuinely discover the world of Biochemistry. Any student that would like to ignore this assumption should visit the **Academic Integrity Policy** at McMaster University for information on academic dishonesty".

Biochem 2EE3 Online Assessment, Expectations

Please note, for all tests: these are to be conducted individually AND in the absence of any other aids (i.e. textbooks, online resources, class notes, peers, Google, previous assignments/tests, etc.). Opening any additional windows on your computer during these assessments will immediately close down your assessment and submit the work as-is. We take all reports of academic dishonesty very seriously and failure to meet specific expectations can lead to a zero on the test and/or a notation of academic dishonesty on your transcripts.

We cannot extend assessment deadlines due to unforeseen technical issues. Please do not leave your assessments until the last minute. For all technical issues encountered please do not email your course instructors as they are, unfortunately, not able to assist with the online assessment technology. Please email Pearson e-support directly (please see Appendix-1, Pearson support information) and they will provide prompt assistance.

Netiquette

When posting on the discussion boards and chat rooms it is important to understand how to interact with one another online. This is called "netiquette": please take a moment and understand why and how you are communicating online. Please note that this is a professional course so your online language must

mirror this professionalism. Please refrain from texting language. We have summarized some of the important netiquette rules below. These were adapted from the following source: http://www.albion.com/netiquette/corerules.html

Remember and respect the human – at the other end of the computer screen.
- ❖ Participate/ help one another.
- ❖ Be positive. Provide constructive criticism.
- ❖ Be patient. Report technical problems.
- ❖ Use professional/formal language. Your text and online presence has a permanent footprint.

COURSE MECHANICS

Requirements

- ✓ TEXTBOOK - Biochemistry: Concepts and Connections , Dean R. Appling, The University of Texas at Austin, Spencer J. Anthony-Cahill, Western Washington University, Christopher K. Mathews, Oregon State University, ISBN-13: 9780134213231, ©2016 • Prentice Hall.

- ✓ For activating your Pearson account, please follow the guidelines in Appendix I, how to register for Pearson online)

- ✓ Pearson online learning platform "My Lab and Mastering Links"– will be provided through the McMaster University Learning Management System: Avenue2Learn (A2L) on the homepage.

Use of Avenue2learn (http://avenue.mcmaster.ca)

This course uses A2L as its launch pad for all other activities: to access online platforms and course materials, to post the course outline, class notices, etc. You should be aware that when you access the electronic components of this course private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure.

Computer Requirements

If you do not have access to a computer off campus, there are many computer labs on campus that you can use to participate in the course. Most public libraries also have computers with internet access that you can use for free. You will need to have an up-to-date browser, operating system and some additional software on your computer to take this class. Use the A2L system check page for hardware & software requirements. Some of the documents in this course will be available to you in PDF form. If you do not have Adobe Acrobat Reader software on your computer, you can download it by going to http://get.adobe.com/reader/ .

STUDENT ACCESSIBILITY

Students who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. **Please provide the course instructor with any necessary accommodation information as soon as possible so that arrangements can be made through the online platform**. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contacted by phone 905-525-9140 ext. 28652 or e-mail

sas@mcmaster.ca. For further information, consult McMaster University's Policy for Academic Accommodation of Students with Disabilities.

ADDITIONAL SNIPPETS

TECH SUPPORT- If you need technical assistance with Avenue2Learn at any time or to report a problem you can contact Avenue support . Any issues with Pearson online platform materials can be reported to Pearson e-support (please see Appendix-I, What Do I Do If I Experience Technical Problems While Working on Mastering Chemistry Assignments)

In online courses, it is normal to have many questions about things that relate to the course, such as clarification about assignments, course materials or assessments. Please post these in the Discussion forum on A2L. This is an open forum, and you are encouraged to give answers and help each other.

COURSE ASSESSMENT

Please note: a missed Activity, Labster or a test (with proper documentation, such as an MSAF) will be re-weighted to the final exam.

If you are absent from the university for a minor medical reason, lasting fewer than 3 days, you may report your absence, once per term, without documentation, using the McMaster Student Absence Form. Absences for a longer duration or for other reasons must be reported to your Faculty/Program office, with documentation, and relief from term work may not necessarily be granted. When using the MSAF, report your absence to bioc2ee3@mcmaster.ca . You must then contact bioc2ee3@mcmaster.ca immediately (normally within 2 working days) by email. Please note that the MSAF may not be used for term work worth 30% or more, nor can it be used for the final examination.

We cannot extend assessment deadlines due to unforeseen technical or personal issues. Please do not leave your assessments until the last minute. For all technical issues encountered please do not email your course instructors as they are, unfortunately, not able to assist with the online assessment technology. Please email Pearson e-support directly (please see Appendix-1, Pearson support information) and they will provide prompt assistance.

Please read the information in this box very carefully before completing any online assessment. It is critical that you read and understand the instructions prior to beginning an assessment.

Assessment Type	Percent (%)
Module Activities **There are 10 activities, each worth 2%** These are INDIVIDUAL assignments that need to be completed. Activities are open for the entire module time and are due at the times specified in the "assessments due date checklist". There is a 10%/hour late penalty for submission after the due date/time.	**20**
Test 1 (Modules 1-4) This is an INDIVIDUAL test that needs to be completed in the ABSENCE of any other aids (i.e. textbooks, online resources, class notes, peers, Google, previous assignments/tests, etc.). The maximum allotted time to complete the test is 60 minutes. Please note: opening any additional windows on your computer during the test will immediately close down your test and submit the work as-is. Also, the test – once opened – will start a time counter. This counter cannot be turned off. You must complete the test once you open it. Additionally, answers cannot be changed once submitted.	**10**
Test 2 (Modules 5-8) This is an INDIVIDUAL test that needs to be completed in the ABSENCE of any other aids (i.e. textbooks, online resources, class notes, peers, Google, previous assignments/tests, etc.). The maximum allotted time to complete the test is 60 minutes. Same note as above applies.	**10**
Labster virtual labs **There are 7 Labster virtual labs, each worth 2%** These are INDIVIDUAL assignments that need to be completed. You may attempt up to 10 times total for each Labster assignment, and the highest score will be used for that particular Labster lab mark. Labster labs are open for the entire module time and are due at the times specified in the "Labster virtual lab due date checklist". There is a 10%/hour late penalty for submission after the due date/time.	**14**
Final Exam This is a multiple choice, **cumulative** exam. This exam will be scheduled by the registrar and conducted in person TBA	**46**

The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.

ASSESSMENT DUE DATE CHECKLIST

MODULES	Module Components	Check when complete (☑)	Due date	Out of (%)
MODULE 1 Available Thu Jan 4	Textbook readings	☐	Not applicable (N/A)	
	Module 1 video(s)	☐	N/A	
	Module 1 activity	☐	Fri Jan 19, 11:59 pm	2
Labster 1 Thu Jan 4	Microscopy	☐	Fri Jan 19, 11:59 pm	2
MODULE 2 Available Thu Jan 11	Textbook readings	☐	N/A	
	Module 2 video(s)	☐	N/A	
	Module 2 activity	☐	Fri Jan 19, 11:59 pm	2
MODULE 3 Available Thu Jan 18	Textbook readings	☐	N/A	
	Module 3 video(s)	☐	N/A	
	Module 3 activity	☐	Fri Jan 26, 11:59 pm	2
Labster 2 Thu Jan 18	Crime Scene Investigation	☐	Fri Jan 26, 11:59 pm	2
MODULE 4 Available Thu Jan 25	Textbook readings	☐	N/A	
	Module 4 video(s)	☐	N/A	
	Module 4 activity	☐	Fri Feb 2, 11:59 pm	2
MODULE 5 Available Thu Feb 1	Textbook readings	☐	N/A	
	Module 5 video(s)	☐	N/A	
Labster 3 Thu Feb 1	Protein Synthesis	☐	Fri Feb 9, 11:59 pm	2
Test -1 (Modules 1-4)		☐	**Saturday Feb 17 Time: 9-11am**	10
MODULE 6 Available Thu Feb 8	Textbook readings	☐	N/A	
	Module 6 video(s)	☐	N/A	
	Module 6 activity	☐	Fri Feb 16, 11:59 pm	2
Labster 4 Thu Feb 8	Next Generation Sequencing	☐	Fri Feb 16, 11:59 pm	2

MODULES	Module Components	Check when complete (☑)	Due date	Out of (%)
MODULE 7 Available Thu Feb 15	Textbook readings	☐	N/A	
	Module 7 video(s)	☐	N/A	
	Module 7 activity	☐	Fri Mar 2, 11:59 pm	2
Labster 5 Thu Feb 15	Introduction to Food Macromolecule	☐	Fri Mar 2, 11:59 pm	2
Feb 19 – 23	Reading week			
MODULE 8 Available Thu Mar 1	Textbook readings	☐	N/A	
	Module 8 video(s)	☐	N/A	
	Module 8 activity	☐	Fri Mar 9, 11:59 pm	2
Labster 6 Thu Mar 1	Carbohydrates	☐	Fri Mar 9, 11:59 pm	2
MODULE 9 Available Thu Mar 8	Textbook readings	☐	N/A	
	Module 9 video(s)	☐	N/A	
Test – 2 (Modules 5-8)		☐	**Saturday, March 17 Time: 9-11am**	10
MODULE 10 Available Thu Mar 15	Textbook readings	☐	N/A	
	Module 10 video(s)	☐	N/A	
	Module 10 activity	☐	Fri Mar 23, 11:59 pm	2
Labster 7 Thu Mar 15	Cellular Respiration	☐	Fri Mar 23, 11:59 pm	2
MODULE 11 Available Thu Mar 22	Textbook readings	☐	N/A	
	Module 11 video(s)	☐	N/A	
	Module 11 activity	☐	Fri April 6, 11:59 pm	2
MODULE 12 Available Thu Mar 29	Textbook readings	☐	N/A	
	Module 12 video(s)	☐	N/A	
	Module 12 activity	☐	Fri April 6, 11:59 pm	2
Cumulative Final Exam		☐	**Date and location: TBA**	46

APPENDIX I

How to Register for Pearson Online

Registering for Modified MasteringChemistry through Avenue to Learn:
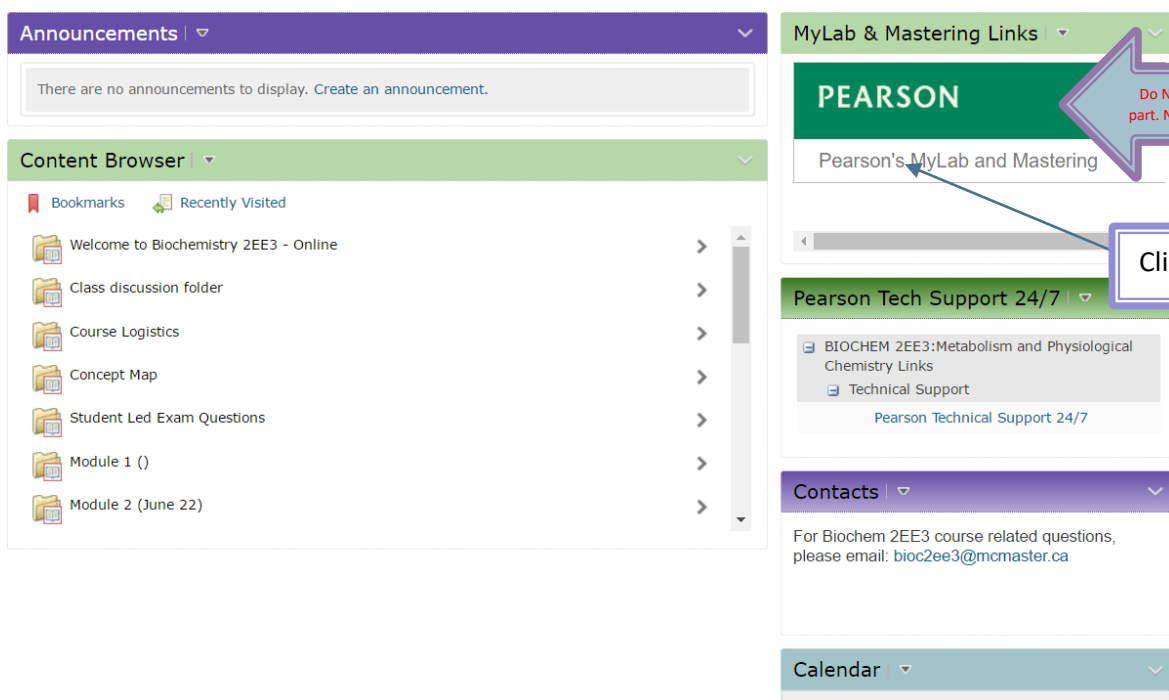
Step 1: Login to Avenue

1. Login to your Avenue to Learn account (http://avenue.mcmaster.ca/)

2. Go to the **BIOCHEM 2EE3** Avenue course within Avenue.

Step 2: On the BIOCHEM 2EE3 Avenue course homepage, locate the Pearson Widget and click right where it says "*Pearson's MyLab and Mastering*". Click the Widget

❖ A new page should open showing two links to MasteringChemistry.
❖ If *nothing* happens when you click the link – make sure your POP UP BLOCKER is disabled. For instructions see here: http://goo.gl/kXWkDS

Please follow the steps below to register your code via Avenue to Learn:

Pearson

Student Registration Instructions

MyLab & Modified Mastering with Avenue to Learn

1. Enter Your Avenue to Learn Course

2. Select **the MyLab & Mastering** widget on the Avenue to Learn course's home page, and then select the **"Open MyLab & Mastering"** tab on the Pearson page.

Get Access to Your Pearson Course Content:

1. Enter your Pearson account **username** and **password** to **Link Accounts**.

   a. Login if you have ever used a Pearson MyLab & Mastering product, such as MyMathLab, MyITLab, MySpanishLab, MasteringBiology or MasteringPhysics.

   b. If you don't have a Pearson account, select Create and follow the instructions.

2. Select an access option:

   a. Enter the access code that is listed above in the email

3. From the You're Done page, select **Go to My Courses**.

Note: We recommend you always enter your MyLab & Modified Mastering course through Avenue to Learn.

Get Your Computer Ready

For the best experience, check the system requirements for your product at:

http://www.pearsonmylabandmastering.com/system-requirements/

Need help?

For help with MyLab & Modified Mastering with MyLearningSpace, go to:http://help.pearsoncmg.com/mylabmastering/d2l/student/en/index.html

A note about the MasteringChemistry links (available in the widget). The names of the MasteringChemistry links are pretty self-explanatory.

- ❖ The links you will use most commonly are:

    1) Mastering Assignments – click here to view a list of the course assignments that are *currently* available for you to work on. For tips on how to complete MasteringChemistry Assignments online see the <u>Assignments section</u> of the student guide.

    2) Mastering Scores – click here once you have completed an assignment for an item-by-item breakdown of your score for an individual assignment. See the student guide <u>Scores section</u> for tips.

    3) Pearson eText – this is pretty self-explanatory! Click here to access an electronic version of the textbook for Appling, *Biochemistry: Concepts and Connections*, 1e.

    4) MasteringChemistry Course Home – this just takes you to the FULL MasteringChemistry course and offers an alternative navigation experience.

Pearson Support Information

What Do I Do If I Experience Technical Problems While Working On Mastering Chemistry Assignments?

If you encounter any issues while working in Mastering Chemistry, it is important that you follow the proper process to have your issue resolved. <u>It is also important that you work on your assignments well ahead of the due dates so that if you do experience technical problems</u>, there will be adequate time for a resolution.

IMPORTANT: DO NOT email your professor until you get to step #4 of the process below.

1. Ensure that you are using an up-to-date version of a supported web browser. To review the Mastering Chemistry System Requirements go to: <u>http://goo.gl/la8q9p</u>
   - ❖ It is recommended that all students, regardless of whether you use a MAC or PC, should download and use Google Chrome or Firefox.
   - ❖ You can also run the browser tune-up by entering the following URL into your browser. <u>http://browsertuneup.pearsoncmg.com/mastering-a/</u>

2. Try searching the Pearson Knowledgebase (URL below) to troubleshoot the problem you are experiencing on your own. There is often a quick fix available and this is an important life skill. When searching the Knowledgebase type "MasteringChemistry" into the search field along with a description of your problem/error code (if applicable). Here is the URL to the Knowledgebase: <u>http://goo.gl/eciSuK</u>

Helpful Articles on the Knowledge Base:

*Session Expired (Idle Time-Out): http://goo.gl/sN4XJP

3. Contact Pearson's 24/7 technical support team. These are professionals that have been trained to troubleshoot your problems quickly and effectively. Do not send technical problems with MasteringChemistry to your instructor unless you have already contacted Pearson's support. After you contact support they will either solve your problem immediately or provide you with an incident number and get back to you. They will follow up with you within 24 hours. **If Pearson support cannot see that an error has occurred, then this problem cannot be fixed. Please do NOT email your course instructor at this time as they cannot do anything to help.**

❖ There are two ways to contact Pearson's technical support team:
i. By Phone (Toll Free) at 1-844-292-7017
ii. Online chat with a live representative: http://goo.gl/5ARxQo

Tips for contacting support:

**Online chat is recommended due to the ease of launching a chat and short wait times.

**Be sure to tell the representative that you are using the modified version of MasteringChemistry that is integrated with your schools Learning Management System (Avenue to Learn).

Labster

Access to the LABSTER simulations

1. Go to your LMS and navigate to your Biochem 2EE3 (Winter 2018) course

2. Under content, you will see Labster 1, click on it to launch

3. Click on the simulation in order to launch it
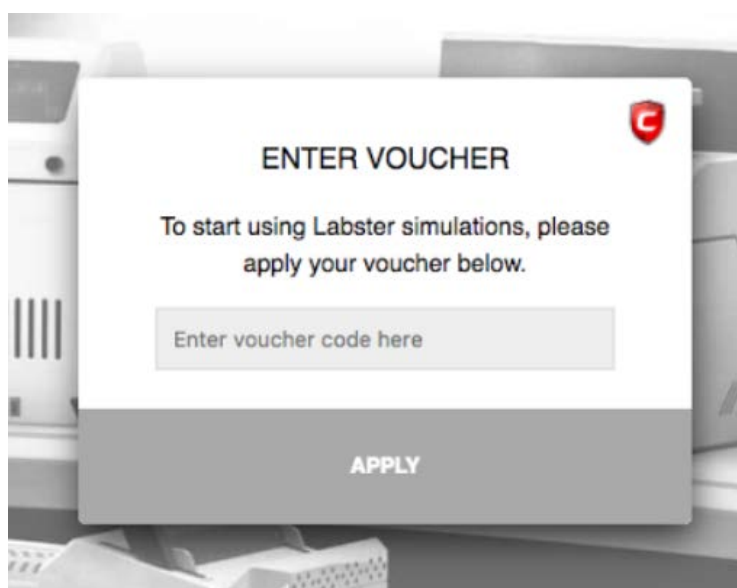
How to use your voucher

Until January 15th 2018, 11:59 PM, you do not need a voucher to access the simulations. When presented with the following pop-up, simply press 'Continue'
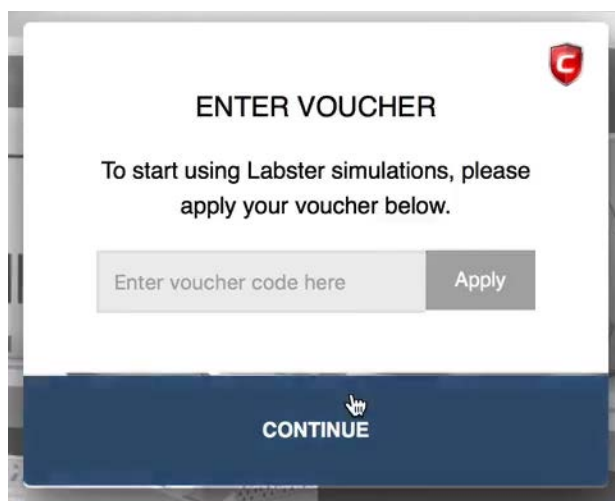
From January 16th 2018 12:00 AM, you will not have the option to press 'Continue' anymore and you will be required to enter a Voucher Code. This code will be sent to you on Monday 15th January if you have not dropped out of the course. **In case you did not receive your voucher, please reach out to Mary Del Mar (delmarm@mcmaster.ca).**

Please take a minute to read this short Labster Help Center article as it contains useful screenshots, detailed instructions and support contact details.

Your Labster voucher is a 10-digit code. It is a personal code that is exclusive to you and to the Biochem 2EE3 course. Your voucher code is personal and cannot be exchanged or shared with anyone. It unlocks access to Labster simulations within your LMS/VLE. This voucher only needs to be applied once and only when presented with the following message:

Please keep your voucher until the end of your course. The activated voucher will present the following message:
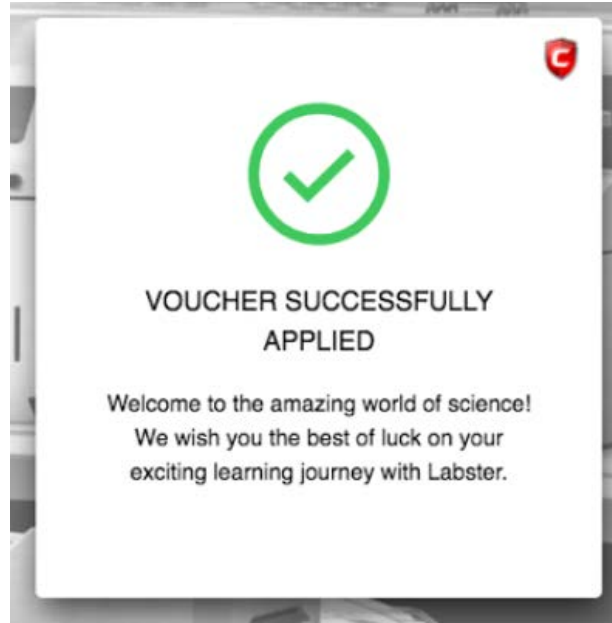
In case you run into issues with your voucher, please contact support@labster.com with your institution email address, your course name and your voucher number.

Grades

You can see your progress and score in the Labster Dashboard. Please read how to access the Labster Dashboard here. Your score will also be visible in your **LMS/VLE gradebook** directly.

What is Labster?

"Labster is a company dedicated to developing fully interactive advanced lab simulations based on mathematical algorithms that support open-ended investigations. We combine these with gamification elements such as an immersive 3D universe, storytelling and a scoring system which stimulates students' natural curiosity and highlights the connection between science and the real world. The labs are being used by California State University, Harvard, Gwinnett Technical College, MIT, Exeter University, University of New Haven, Stanford, University of New England, Trinity College, University of Hong Kong and Berkeley among others internationally.

We value strong relationships among our partners, teammates and collaborators. We are working with leading universities globally including MIT, Harvard and Imperial College, and we have received more than 10m USD in grant funding for cutting edge R&D projects.

We believe that a collaborative, motivational working environment is the key to innovation. With a diverse staff throughout our offices in Copenhagen, Denmark and Bali, Indonesia, our company culture is one of leadership, contribution, and integrity." (Excerpt taken directly from the company website: https://www.labster.com/)

Why Labster?

Labster is currently implemented in a number of well-known universities, and the impact of their virtual labs has been published in reputable journals like Nature Biotechnology and BMC medical education (see citations below):

1. Bonde, Mads T., et al. "Improving biotech education through gamified laboratory simulations." *Nature biotechnology* 32.7 (2014): 694-697.
2. Makransky, Guido, et al. "Simulation based virtual learning environment in medical genetics counseling: an example of bridging the gap between theory and practice in medical education." *BMC medical education* 16.1 (2016): 1.

The future for Labster (check out the following TED video from Michael Bodekaer, cofounder and chief technical officer of Labster):

http://www.ted.com/talks/michael_bodekaer_this_virtual_lab_will_revolutionize_science_class

APPENDIX II

Textbook Readings

The content covered in the module videos is all testable material (including compounds, enzymes, reactions, structures and values) and is supplemented by the following required textbook readings for the course. You need only read the sections indicated. Essential figures and tables are also indicated. All content from the readings, tables and figures indicated is testable and is to be understood in terms of fundamental concepts. Where specified, you must also memorize compound names, enzyme names, reactions, structures and/or values. Content in Labster virtual labs and all supplementary videos will not be tested.

MODULE #	TEXTBOOK READINGS
1	**Chapter 1 - Biochemistry and the Cell** Section 1.2 – the elements and molecules of living systems (p. 7-8, Figure 1.4) The chemical elements of cells and organisms Section 1.3 - distinguishing characteristics of living systems (pp. 12-13)

2	**Chapter 2 – The Chemical Foundations of Life: Weak Interactions in an Aqueous Environment**
	Section 2.3 – the role of water in biological processes (pp. 26-30, Figure 2-12, 2.13, 2.14, 2.15)
	Section 2.4 – Acid-base equilibria (pp. 30-36)
	   ○ acids and bases: proton donors and acceptors
	   ○ ionization of water and the ion product (Table 2.6 for information only: do not memorize these values)
	   ○ the pH scale and the physiological pH range (Figure 2.17, 2.18, 2.19)
	   ○ buffer solutions
	   ○ molecules with multiple ionizable groups (Figure 2.20)

	Labster 1 – Microscopy ○ Watch video: https://www.youtube.com/watch?v=b4WOsYktdn4&t=1s

3	**Chapter 4 – Nucleic Acids**
	Section 4.1- nucleic acids: informational macromolecules (pp. 74 – 79, do NOT memorize table 4.1)
	   ○ the two types of nucleic acid: DNA and RNA (Figure 4.1, 4.2, 4.3, 4.4)
	   ○ properties of the nucleotides (Figure 4.5)
	   ○ stability and formation of the phosphodiester linkage (first paragraph only and the corresponding calculation p. 78 along with Figure 4.8)
	Section 4.2 – primary structure of nucleic acids (pp. 79 – 80, Figure 4.9)
	Chapter 5 – Introduction to Proteins: the Primary Level of Protein Structure
	Section 5.1 – amino acids (p. 111)
	   ○ Structure of the α amino acids (p. 111, Figure 5.2, 5.3 - know the structures and properties of each amino acid as shown in the video figures. Table 5.1 – know the 1- and 3-letter abbreviations and general trends in the ionisable groups. You do NOT need to memorize the actual pKas, residue mass or occurrence in proteins)
	Section 5.2 – peptides and the peptide bond (p. 117)
	The structure of the peptide bond (p. 117 and video figures associated with this concept)

	Labster 2 – Crime Scene Investigation
	   ○ Watch video: PCR-general
	      https://www.youtube.com/watch?v=3XPAp6dgl14
	   ○ Watch video: Short Tandem Repeat
	      https://www.youtube.com/watch?v=9bEAJYnVVBA

4	**Chapter 6 – The Three-Dimensional Structure of Proteins** Section 6.1 – secondary structure: regular ways to fold the polypeptide chain ○ α helices and β sheets (p. 148, Figure 6.4, 6.5)

	Section 6.2 – fibrous proteins: structural materials of cells and tissues
	   ○ the keratins (pp. 152-153, Figure 6.12)
	   ○ collagen (pp. 154-156, figure 6.14)
	Section 6.3 – globular proteins: tertiary structure and functional diversity (pp. 156-157, Figure 6.15)
	Chapter 7 – Protein Function and Evolution
	Section 7.1 –7.7 (pp. 192-199) Of these, section 7.1-7.4 are testable. Sections 7.5-7.7 are for information purposes only.

5	**Chapter 4 – Nucleic Acids**
	Section 4.3 – secondary and tertiary structures of nucleic acids
	   ○ the DNA double helix (p. 81)
	   ○ x-ray analysis of DNA fibers (pp. 81-83, Figure 4.12, 4.13)
	   ○ semiconservative nature of DNA replication (p. 83, Figure 4.14)
	Section 4.6 – the biological functions of nucleic acids
	   ○ replication: DNA to DNA (pp. 94-95, Figure 4.32)
	Chapter 22 – DNA Replication
	Section 22.1 – early insights into DNA replication (pp. 678-679, Figure 22.1, 22.2, 22.3)
	Section 22.2 – DNA polymerases: enzymes catalyzing polynucleotide chain elongation
	   ○ structure and activities of DNA polymerase I (p. 679, figure 22.4)
	   ○ DNA substrates for the polymerase reaction (p. 680, Figure 22.5)
	   ○ Structure of DNA polymerase I (p. 681, Figure 22.6)
	   ○ Discovery of additional polymerases (p. 681)
	   ○ Structure and mechanism of DNA polymerases (p. 682, Figure 22.7)
	Section 22.3 – other proteins at the replication fork (pp. 683-692, Figures 22.13, 22.15, 22.16, 22.19, and 22.26) – please note: there is a lot of detail in these sections so please only focus on the content specified in the corresponding module videos and the figures highlighted above.

	Labster 3 – Protein Synthesis
	   ○ Watch video: Mass Spectrophotometer Introduction
	     https:// www.youtube.com/watch?v=NuIH9-6Fm6U
	   ○ Watch video: MALDI-TOF Mass Spectrophotometer
	     https://www.youtube.com/watch?v=8R1Oyqx5KfE

6	**Chapter 24 – Transcription and Post-Transcriptional Processing**
	Section 24.3 – mechanism of transcription in bacteria (pp. 737-741, Figure 24.10, 24.12)
	Section 24.5 – post-transcriptional processing
	   ○ Bacterial mRNA turnover (p. 746)
	   ○ Post-transcriptional processing in the synthesis of bacterial rRNAs and tRNAs (rRNA processing – p. 747; tRNA processing, pp. 747-748 and Figure 24.2)
	Chapter 25 – Information Decoding: Translation and Post-Translational Protein Processing
	Section 25.1 – an overview of translation (pp. 758-759, Figure 25.1)
	Section 25.2 – the genetic code (p. 759)
	   ○ Features of the code (pp. 760-761, Figure 25.4 – know how to use this table. You are NOT required to memorize it.)
	   ○ The wobble hypothesis (pp. 761-762, Figure 25.5)
	   ○ Punctuation: stopping and starting (p. 762)
	Section 25.4 – mechanism of translation (pp. 771-775, Figure 25.20, 25.21)

	Labster 4 – Next Generation Sequencing
	   ○ Watch video: Sanger sequencing
	     https://www.youtube.com/watch?v=ry4HLAJMIuw
	   ○ Watch video: Next Generation Sequencing
	     https://www.youtube.com/watch?v=jFCD8Q6qSTM&feature=youtu.be

7	**Chapter 20 – Mechanisms of Signal Transduction**

Section 20.0 – mechanisms of signal transduction (p. 624-625)
Section 20.1 – an overview of hormone action (introduction, p. 626-627)
○ Chemical nature of hormones and other signaling agents (p. 627)
Section 20.2 – modular nature of signal transduction systems: G protein-couple signaling (p. 628)
○ Receptors as defined by interactions with drugs (p. 628)
Chapter 12 – Carbohydrate Metabolism: Glycolysis, Gluconeogenesis, Glycogen Metabolism, and the Pentose Phosphate Pathway
Section 12.9 – coordinated regulation of glycogen metabolism (p. 399)
○ Structure of glycogen phosphorylase (p. 399-400)
○ Control of phosphorylase activity (p. 400, Figure 12.26)
○ Proteins in the glycogenolytic cascade (p. 400-402)

Labster 5 – Introduction to Food Macromolecule
○ Watch video: https://www.youtube.com/watch?v=ApRfZP8tQ74&t=304s

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Labster 6 – Carbohydrates
○ **Watch video:** https://www.youtube.com/watch?v=1KgDXDLZNJI

9 | **Chapter 12 – Carbohydrate Metabolism: Glycolysis, Gluconeogenesis, Glycogen Metabolism, and the Pentose Phosphate Pathway**

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