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COURSE INTRODUCTION

Welcome to Biochemistry 2EE3. We are extremely excited to have you on board and together we will explore the very concept that is biochemistry. Biochemistry is everywhere you look: from disease to food to emotions. In this course we will discuss many Biochemistry concepts; 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. 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: biochemistryadvisor@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, ALL online assessments (i.e. activities, tests, concept map, etc.) are to be conducted INDIVIDUALLY. For activities and 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 out specific expectations can lead to a zero in the course 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 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,
  Hall.
✓ You have the option of purchasing the physical textbook with the access code or just the access
code (the access code allows you access to the e-text version of the book). For activating your
Pearson account, please follow the guidelines in Appendix I, how to register for Pearson online)
Pearson course ID: vulcu07748
✓ 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 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
**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: all missed assessments (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 biochemistryadvisor@mcmaster.ca. You must then contact biochemistryadvisor@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-I, 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.

<table>
<thead>
<tr>
<th>Assessment Type</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Module Activities</strong></td>
<td><strong>20</strong></td>
</tr>
<tr>
<td>There are 10 activities, each worth 2%</td>
<td></td>
</tr>
<tr>
<td>These are INDIVIDUAL assignments that need to be completed in the ABSENCE of any other aids (i.e. textbooks, online resources, class notes, peers, Google, previous assignments/tests, etc.). 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. There is also a 10% penalty for each hint opened (where applicable). Please note: opening any additional windows on your computer during the activity will immediately close down your activity and submit the work as-is.</td>
<td></td>
</tr>
<tr>
<td><strong>Test 1 (Modules 1-4)</strong></td>
<td><strong>15</strong></td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td><strong>Test 2 (Modules 5-8)</strong></td>
<td><strong>15</strong></td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td><strong>Concept Map</strong></td>
<td><strong>5</strong></td>
</tr>
<tr>
<td>This is an INDIVIDUAL assignment that can be completed with the use of any and all aids at your disposal. Please ensure that your work is original and cited properly.</td>
<td></td>
</tr>
<tr>
<td><strong>Student Led Exam Question Design</strong></td>
<td><strong>5</strong></td>
</tr>
<tr>
<td>This is an INDIVIDUAL assignment that can be completed with the use of any and all aids at your disposal. Please ensure that your work is original.</td>
<td></td>
</tr>
<tr>
<td><strong>Final Exam</strong></td>
<td><strong>40</strong></td>
</tr>
<tr>
<td>This is a multiple choice, cumulative exam. This exam will be conducted in person on August 3rd, 2016 from 7-9pm in HH 109.</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Modules</th>
<th>Module Components</th>
<th>Check when complete (☑)</th>
<th>Due Date</th>
<th>Out of (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept Map</td>
<td></td>
<td></td>
<td>Tues Aug 2\textsuperscript{nd}, noon</td>
<td>5</td>
</tr>
<tr>
<td>Available June 20\textsuperscript{th}</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student Led Exam Question Design</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Available June 20\textsuperscript{th}</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Module 1</strong></td>
<td>Textbook readings</td>
<td>☐</td>
<td>Not applicable (N/A)</td>
<td></td>
</tr>
<tr>
<td>Available June 20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Module 1 video(s)</td>
<td></td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Module 1 activity</td>
<td></td>
<td></td>
<td>Mon June 27\textsuperscript{th}, noon</td>
<td>2</td>
</tr>
<tr>
<td><strong>Module 2</strong></td>
<td>Textbook readings</td>
<td>☐</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Available June 22</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Module 2 video(s)</td>
<td></td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Module 2 activity</td>
<td></td>
<td></td>
<td>Wed June 29\textsuperscript{th}, noon</td>
<td>2</td>
</tr>
<tr>
<td><strong>Module 3</strong></td>
<td>Textbook readings</td>
<td>☐</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Available June 27</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Module 3 video(s)</td>
<td></td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Module 3 activity</td>
<td></td>
<td></td>
<td>Mon July 4\textsuperscript{th}, noon</td>
<td>2</td>
</tr>
<tr>
<td><strong>Module 4</strong></td>
<td>Textbook readings</td>
<td>☐</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Available June 29</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Module 4 video(s)</td>
<td></td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Module 4 activity</td>
<td></td>
<td></td>
<td>Wed July 6\textsuperscript{th}, noon</td>
<td>2</td>
</tr>
<tr>
<td><strong>Module 5</strong></td>
<td>Textbook readings</td>
<td>☐</td>
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<td></td>
</tr>
<tr>
<td>Available July 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Module 5 video(s)</td>
<td></td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td><strong>Test -1 (Modules 1-4)</strong></td>
<td></td>
<td></td>
<td>Mon July 4\textsuperscript{th} Available 7-9 pm</td>
<td>15</td>
</tr>
<tr>
<td><strong>Module 6</strong></td>
<td>Textbook readings</td>
<td>☐</td>
<td>N/A</td>
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<tr>
<td>Available July 6</td>
<td></td>
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<td></td>
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<tr>
<td>Module 6 video(s)</td>
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<td>N/A</td>
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</tr>
<tr>
<td>Module 6 activity</td>
<td></td>
<td></td>
<td>Wed July 13\textsuperscript{th}, noon</td>
<td>2</td>
</tr>
<tr>
<td><strong>Module 7</strong></td>
<td>Textbook readings</td>
<td>☐</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Available July 11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Module 7 video(s)</td>
<td></td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Module 7 activity</td>
<td></td>
<td></td>
<td>Mon July 18\textsuperscript{th}, noon</td>
<td>2</td>
</tr>
<tr>
<td>MODULES</td>
<td>Module Components</td>
<td>Check when complete (✓)</td>
<td>Due date</td>
<td>Out of (%)</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------------</td>
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<td>------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>MODULE 8</td>
<td>Textbook readings</td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Available</td>
<td>Module 8 video(s)</td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>July 13</td>
<td>Module 8 activity</td>
<td></td>
<td>Wed July 20&lt;sup&gt;th&lt;/sup&gt;, noon</td>
<td>2</td>
</tr>
<tr>
<td>MODULE 9</td>
<td>Textbook readings</td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Available</td>
<td>Module 9 video(s)</td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>July 18</td>
<td></td>
<td></td>
<td>Mon July 18&lt;sup&gt;th&lt;/sup&gt;</td>
<td>15</td>
</tr>
<tr>
<td>Test – 2 (Modules 5-8)</td>
<td></td>
<td></td>
<td>Available 7-9 pm</td>
<td></td>
</tr>
<tr>
<td>MODULE 10</td>
<td>Textbook readings</td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Available</td>
<td>Module 10 video(s)</td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>July 20</td>
<td>Module 10 activity</td>
<td></td>
<td>Wed July 27&lt;sup&gt;th&lt;/sup&gt;, noon</td>
<td>2</td>
</tr>
<tr>
<td>MODULE 11</td>
<td>Textbook readings</td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Available</td>
<td>Module 11 video(s)</td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>July 25</td>
<td>Module 11 activity</td>
<td></td>
<td>Tues Aug 2&lt;sup&gt;nd&lt;/sup&gt;, noon</td>
<td>2</td>
</tr>
<tr>
<td>MODULE 12</td>
<td>Textbook readings</td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Available</td>
<td>Module 12 video(s)</td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>July 27</td>
<td>Module 12 activity</td>
<td></td>
<td>Wed Aug 3&lt;sup&gt;rd&lt;/sup&gt;, noon</td>
<td>2</td>
</tr>
<tr>
<td>Cumulative Final Exam</td>
<td></td>
<td></td>
<td>Wed Aug 3&lt;sup&gt;rd&lt;/sup&gt;, 7-9pm</td>
<td>40</td>
</tr>
</tbody>
</table>
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/](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](http://goo.gl/kXWkDS)
**Step 3: Launch Registration**

1. Click any of the MasteringChemistry links to initiate the registration wizard.

- You will have to register for MasteringChemistry the **FIRST** time you click on any of the links.
- After you complete the one-time registration process, clicking on any of the links will take you directly to the specified page in MasteringChemistry without having to sign in separately.

**Step 4: Complete the Registration Wizard**

1. Read and Accept the End-User License Agreement and Privacy Policy

2. On the next page, you will be asked to CREATE a Pearson account or sign into an EXISTING account.
   
   - If this is your first time registering for a Pearson product, click Create to create a username and password.
If you already have a Pearson Account (if you use a Pearson product in one of your other courses) you should sign into your account by entering your Username and Password into the fields provided.

3. To create a new account click “Create” and fill out the necessary information.

**Note: Please fill out your First and Last name fields exactly as they read inside Avenue and use your McMaster email address. Failure to do so will result in a mark of zero in the course.**

4. Then, pick your registration option. Click the Access Code button and then enter your 31-digit access code that you purchased from the McMaster Bookstore. Or, click the options to purchase access directly online (you will need a valid credit card to purchase online).

**Step 4: continued more about your purchase options.**

To get access to Modified MasteringChemistry, select your preferred Registration Option:

- If you have a 31-character access code to Modified MasteringChemistry. Click the **Access Code** button, enter your access code, and click Finish. Access codes are available at the McMaster Campus bookstore in the required package.
- If you do not have an access code, you will need to purchase one. Under **Use a Credit Card or PayPal**, click the payment button with the applicable price for the version of Modified MasteringChemistry you want to purchase and then enter your Payment information.
- The **$113.95 USD** button provides access to a version of Modified MasteringChemistry which includes an interactive eText for Appling, Biochemistry: Concepts and Connections, 1e.
- The **$65.95 USD** button provides access to a version of Modified MasteringChemistry which **DOES NOT** include an eText -- you will still be able to complete your MasteringChemistry Assignments with this version, but will not be able to access the electronic textbook online.

- **Important**: If you choose to register using the 14-day temporary access option, then you must pay to upgrade your temporary account to full BEFORE your trial expires. Instructions on how to do this can be found [here](#).
Step 5: You’re Done!

When you see the “You’re done!” screen – you have successfully completed registration.

Print this screen for your records (you will also receive an email).

From now on, you will be able to directly access the MasteringChemistry links that are available from the Pearson Widget.

**You MUST login to Avenue first.**

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 common 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 Assignments section 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 Scores section for tips.
  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. It is also important that you work on your assignments well ahead of the due dates so that if you do experience technical problems, 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: [http://goo.gl/la8q9p](http://goo.gl/la8q9p)
   - 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. [http://browsertuneup.pearsoncmg.com/mastering-a/](http://browsertuneup.pearsoncmg.com/mastering-a/)

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: [http://goo.gl/eciSuK](http://goo.gl/eciSuK)

Helpful Articles on the Knowledge Base:


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. iOnline chat with a live representative: [http://goo.gl/5ARxQo](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).**
**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.

<table>
<thead>
<tr>
<th>MODULE #</th>
<th>TEXTBOOK READINGS</th>
</tr>
</thead>
</table>
| 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) |
| 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 on p. 78 along with Figure 4.8)  
Section 4.2 – primary structure of nucleic acids ( pp. 79 – 80, Figure 4.9) |
| 4        | **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) |
| 5        | **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) |
| 6        | **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. They would make great material for your final concept map assignment. |
| 7        | **Chapter 4 – Nucleic Acids**  
Section 4.3 – secondary and tertiary structures of nucleic acids  
- the DNA double helix (p. 81) |
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.

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)

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)

Chapter 3 – The Energetics of Life
Section 3.0 – the energetics of life (p. 49)
Section 3.4 – free energy in biological systems (p. 60)
- Organic phosphate compounds as energy transducers (p. 60-63)
- Phosphoryl group transfer potential (p. 63, Figures 3.5, 3.6, 3.7)

Chapter 11 – Chemical Logic of Metabolism
Section 11.0 – chemical logic of metabolism (p. 334-335)
Section 11.1 – a first look at metabolism (p. 336-337)
Section 11.2 – freeways on the metabolic road map (p. 337-341)
Section 11.3 – biochemical reaction types (p. 341)
- Oxidations and reductions (p. 344)
<table>
<thead>
<tr>
<th>Section 11.4 – bioenergetics of metabolic pathways (p. 344)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxidation as a metabolic energy source (p. 345)</td>
</tr>
<tr>
<td>Biological oxidations: energy release in small increments (p. 345)</td>
</tr>
<tr>
<td>Energy yields, respiratory quotients, and reducing equivalents (p. 345-346)</td>
</tr>
<tr>
<td>ATP as a free energy currency (p. 346-347, stop reading before the paragraph that starts with “Imagine, instead, an ancient cell that mutated in such a way that it acquired an...”)</td>
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<td>Other high-energy phosphate compounds (p. 351-352)</td>
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<td>Other high-energy nucleotides (p. 352)</td>
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<td>Adenylate energy charge (p. 352)</td>
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<tr>
<td>Sections 11.5 – major metabolic control mechanisms (p. 352)</td>
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<tr>
<td>Control of enzyme activity (p. 353)</td>
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<td>Compartmentation (p. 353-354)</td>
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<tr>
<td>Hormonal control (p. 355)</td>
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</table>

**Chapter 8** – Enzymes: Biological Catalysts

Section 8.8 – the regulation of enzyme activity (p. 260)

- Substrate-level control (p. 260)
- Feedback control (p. 260-261)
- Allosteric enzymes (p. 261)

Section 8.9 – covalent modifications used to regulate enzyme activity (p. 264, Figure 8.39)

Section 8.5 – coenzymes, vitamins, and essential metals (p. 247)

- Coenzyme function in catalysis (p. 247-249)

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

Section 12.0 – carbohydrate metabolism: glycolysis, gluconeogenesis, glycogen metabolism and the pentose phosphate pathway (p. 368-371, Figure 12.1)

Section 12.1 – an overview of glycolysis (p. 371)

- Relation of glycolysis to other pathways (p. 371)
- Anaerobic and aerobic glycolysis (p. 371-372)

Section 12.5 – gluconeogenesis (p. 384)

- Physiological need for glucose synthesis in animals (p. 384)
- Enzymatic relationship of gluconeogenesis to glycolysis (p. 385)
- Substrates for gluconeogenesis (p. 387-388)

Section 12.8 – glycogen metabolism in muscle and liver (p. 396)

- Glycogen breakdown (p. 396-397, Figure 12.22)
- Glycogen biosynthesis (p. 397-399, Figure 12.25)

**Chapter 13** – The Citric Acid Cycle

Section 13.0 – the citric acid cycle (p. 414-417, Figure 13.1)

Section 13.1 – overview of pyruvate oxidation and the citric acid cycle (p. 417)

- The three stages of respiration (p. 417)
- Chemical strategy of the citric acid cycle (p. 418-419, stop before the paragraph that starts with “The oxidation of acetyl-CoA to 2 CO₂ would seem to be a relatively simple..“)

Section 13.4 – stoichiometry and energetics of the citric acid cycle (p. 431-432)

Section 13.5 – regulation of pyruvate dehydrogenase and the citric acid cycle (p. 432-434)

Section 13.8 – anaplerotic sequences: the need to replace cycle intermediates (p. 435-437)

**Chapter 14** – Electron Transport, Oxidative Phosphorylation, and Oxygen Metabolism

Section 14.0 – electron transport, oxidative phosphorylation, and oxygen metabolism (p. 444-446, Figure 14.1)

Section 14.1 – the mitochondrion: scene of the action (p. 447, Figure 14.2)

Section 14.4 – oxidative phosphorylation (p. 457)

- Mechanism of oxidative phosphorylation: chemiosmotic coupling (p. 459-460)
- Uncouplers act by dissipating the proton gradient (p. 461)

**Chapter 16** – Lipid Metabolism

Section 16.0 – lipid metabolism (p. 506-507, Figure 16.1)
| Section 16.1 – utilization and transport of fat and cholesterol (p. 509) |
| Section 16.2 – fatty acid oxidation (p. 517) |
| Fatty acid activation and transport into mitochondria (p. 519) |
| **Chapter 17 – Interorgan and Intracellular Coordination of Energy Metabolism in Vertebrates** |
| Section 17.0 – interorgan and intracellular coordination of energy metabolism in vertebrates (p. 548-550) |
| Section 17.1 – interdependence of the major organs in vertebrate fuel metabolism (p. 550) |
| Metabolic division of labor among the major organs (p. 550-553) |
| Section 17.2 – hormonal regulation of fuel metabolism (p. 553-555, Figure 17.1, Table 17.1) |
| Section 17.3 – responses to metabolic stress: starvation, diabetes (p. 559-560) |
| Starvation (p. 560-561) |
| Diabetes (p. 561-562) |
Concept Map Guidelines and Marking Scheme

This is an individual student assignment worth 5% of the final mark in Biochemistry 2EE3. There are 2 components to this assignment:

1. Choose at least 10 concepts covered in Biochemistry 2EE3 (these include specific ideas like specific nucleotides, amino acids, proteins, pathways, etc.) and, using ONE concept map, connect these concepts to biomedical problems (like disease, diets, diagnostics, biotechnology, etc.). Each connection point should be identified by a number. It is perfectly acceptable (and highly sought after) to have multiple connection points between these.

2. A table consisting of each connection point number followed by a brief description of how this link is made (2-3 sentences).

The concept map should be visually appealing, easy to follow and read AND should be appropriately referenced (any citation style, but keep it consistent throughout), with a reference list at the end. The team concept map needs to be electronically made (I recommend using PowerPoint) and fit on one page (though you can increase the dimensions a bit). You may not draw out the concept map using paper/pen and take a picture of it for submission.

You can take inspiration from the “tools of biochemistry” sections of your Pearson textbook. Here are some other great content resources:

- http://www.biotechniques.com/
- http://www.nature.com/scitable

You should also connect with your assigned TA throughout this process so they can provide input and feedback.

Marking Scheme

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>Excellent (10)</th>
<th>Good (9-8)</th>
<th>Satisfactory (7-6)</th>
<th>Needs improvement (&lt;6)</th>
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<tbody>
<tr>
<td>Organization and Content</td>
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<td>Well organized</td>
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<td>Logical flow between ideas</td>
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<td>and how they relate</td>
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<td>Highlights main concepts</td>
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<td>and their connections</td>
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<tr>
<td>Appropriate use of</td>
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<td>terminology, grammar,</td>
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<td>references</td>
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<td>Overall: concepts, key words</td>
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<td>and flow are organized in</td>
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<td>a cohesive body of work</td>
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| Description of connection    |               |            |                   |                        |
| points                       |               |            |                   |                        |
| Specific points: Clear       |               |            |                   |                        |
| description of why 2 concepts|               |            |                   |                        |
| are connected.               |               |            |                   |                        |
| Specific points: Thoughtful  |               |            |                   |                        |
| connection point (i.e. there  |               |            |                   |                        |
| is a valid connection between|               |            |                   |                        |
| the two concepts)            |               |            |                   |                        |
| Overall connection points:   |               |            |                   |                        |
| sufficient number of         |               |            |                   |                        |
| connection points made       |               |            |                   |                        |
| throughout                   |               |            |                   |                        |
| X                            |               |            |                   |                        |

MARK (max. 20 points):
Brief justification for mark:
Biochemistry 2EE3 example concept map

Biomedical Problems

1. DNA
   - Your concept here

2. Genes
   - Your concept here

3. Proteins
   - Your concept here

Biochemistry 2EE3 concepts

4. Cloning
   - DNA
   - Genes

5. PCR
   - DNA
   - Genes

Connection point

Cancer

- Your concept here
- Your concept here
- Your concept here
<table>
<thead>
<tr>
<th>Connection point</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DNA-Genes:</strong> DNA is the genetic material that encodes genes. By definition, a gene is a region of DNA that encodes for a functional protein or RNA product.</td>
<td>DNA-PCR: Polymerase Chain Reaction (PCR) is a biochemical technique which allows for the amplification of DNA in a test tube using DNA primers, a thermostable DNA polymerase, etc.</td>
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<tr>
<td><strong>1</strong> DNA – Genes DNA – PCR</td>
<td></td>
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<tr>
<td><strong>2</strong> Genes - Proteins Genes - Cancer Genes - PCR</td>
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</tbody>
</table>

Reference list:
Any citation style is fine as long as you embed the references numerically throughout the table and you create a full citation list at the end of your document.
Student-Led Discussion Guidelines
This is an individual student assignment worth 5% of the final mark in Biochemistry 2EE3. There are 2 components to this assignment:

1. Each student must create 5 multiple choice questions based on material directly covered in Biochemistry 2EE3 and post the questions in the A2L “Student Led Exam Questions” discussion forum. Please start a new thread for each of your questions. On the “enter a subject” line please title each question using the following: Question # (1-5), please do not post the answers. The questions created must be well thought out, original and application-based (can include case studies, scenarios and other concepts related directly to material covered in Biochemistry 2EE3). The questions must sample 5 different modules.

The questions that you generate should require higher-level thinking and not simply rely on rote memorization. The reader should be able to apply information that has been acquired through the course. Select a concept that is of interest to you and through searching the course resources, online resources or PubMed, identify a real-life application or fundamental principle where this course concept can be illustrated and applied.

Example Question 1:
Given the following DNA sequence (both sense and antisense strands are shown):

5’ ATG AGT ATT CAA CAT TTC CGT GTC GCC CTT ATT CCC TTT TTT GCG GCA TTT TGC CCT TAG 3’
3’TAC TCA TAA GTT GTA AAG GCA CAG CGG GAA TAA GGG AAA AAA CGC CGT AAA ACG GAA GGA ATC 5’

What does the resulting mRNA sequence look like?

a. UAC UCA UAA GUA GUA AAG GCA CAG CGG GAA UAA GGG AAA AAA CGC CGU AAA ACG GAA GGA AUC
b. AUG AGU AUU CAA CAU UUC CGU GUC GCC CUU AUU CCC UUU UUU GCG GCA UUU UGC CUU CCU UAG
c. TAC TCA TAA GTT GTA AAG GCA CAG CGG GAA TAA GGG AAA AAA CGC CGT AAA ACG GAA GGA ATC
d. AUG AGU AUU CAA CAU UUC CGU GTC GCC CTT ATT CCC TTT TTT GCG GCA TTT TGC CCT CTT TAG
e. ATG AGT ATT CAA CAT TTC CGT GTC GCC CTT ATT CCC TTT TTT GCG GCA TTT TGC CCT CTT TAG

Example Question 2:
Many healthcare clinicians are against the use of Oral Glucose Tolerance Tests as a diagnostic tool for Diabetes Mellitus due to the significant incidents of false positives. This test is associated with the presence of various stressors. For instance, if patients have anxiety over venipunctures, they may generate sufficient epinephrine leading to responses that are detected positive for Diabetes Mellitus. The over diagnosis of diabetes by the Oral Glucose Tolerance Test is because epinephrine initiates the same pathway as glucagon, and:

a. Leads to phosphorylation of glycogen synthase which catalyzes glycogen to glucose-1-phosphate reaction.
b. Directly activates glucagon which activates phosphofructokinase, hence increasing blood glucose levels in the body.
c. Stimulates glycogenolysis through the activation of glycogen phosphorylase and inhibits glycogenesis.
d. Does more than one of the above.
2. Each student must peer-review 5 other questions posted on the A2L. This will take place in the A2L “Student Led Exam Questions” discussion forum. The intention of this component is to provide peer review to a colleague on the appropriateness of the questions and answers, to debate the correct answer and the distractors. For example, can the question or possible answers be modified/improved upon to better test student comprehension and learning? Please provide a narrative for each question and answer that you are asked to review with supporting explanation. You will be expected to provide constructive feedback and suggestions, and possible alternate answers.

To obtain participation marks on this component, each student must submit the following pdf file to the appropriate A2L assignments folder no later than Wednesday July 20th, noon.

- The 5 questions created by the student, along with the answer and detailed feedback to explain each choice (a, b, c, d, e), why it was chosen and why it is correct/incorrect. Please include the module used as the inspiration for each question.
- The 5 questions peer-reviewed by the student and a summary of their input to each question.

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>0.5 point</th>
<th>1 point</th>
<th>1.5 points</th>
<th>2 points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Questions</td>
<td>Less than 2 multiple choice questions</td>
<td>2-3 multiple choice questions</td>
<td>3-4 multiple choice questions</td>
<td>5 (or more) multiple choice questions</td>
</tr>
<tr>
<td>Peer Review</td>
<td>Peer reviewed less than 2 multiple choice questions</td>
<td>Peer reviewed 2-3 multiple choice questions</td>
<td>Peer reviewed 3-4 multiple choice questions</td>
<td>Peer reviewed 5 (or more) multiple choice questions</td>
</tr>
<tr>
<td>Peer Review Feedback</td>
<td>Little to no attempt at feedback</td>
<td>Some attempt but not well constructed or lacking in originality</td>
<td>Well-constructed, original feedback but gaps in knowledge</td>
<td>Very thoughtful, original and well-constructed</td>
</tr>
</tbody>
</table>

**CONTENT**

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>Needs improvement (&lt;6)</th>
<th>Satisfactory (7-6)</th>
<th>Good (9-8)</th>
<th>Excellent (10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content of Questions</td>
<td>The content of the questions is directly related to the material covered in the Biochemistry 2EE3 modules.</td>
<td>The content only covers 5 different modules.</td>
<td>Content displays higher order thinking – it is thoughtfully generated using application-type questions</td>
<td>Content and answers are correct. Questions are designed well with respect to grammar, sentence structure and use of scientific terminology.</td>
</tr>
</tbody>
</table>

**MARK (max. 16 points):**
Brief justification for mark:

The End