Biological Sciences 2A (BIS2A)
Summer Session 1, 2019
Dr K. Dean (University College Cork)
Professor M. Igo (UC Davis)

Introduction

Welcome to Biological Sciences 2A. BIS2A is a 5-unit course with four, 2-hour lectures plus two, 2-hour discussion sessions each week. This will be taught over a five-week period at University College Cork, in the School of Biochemistry and Cell Biology.

BIS2A is NOT a general survey of biology. Rather, BIS2A is the one of three courses in the Biological Sciences lower division core sequence. This sequence provides a foundation in modern biology for a broad range of majors. In BIS2A, you will be introduced to the fundamental chemical, molecular, genetic, and cellular building blocks of living organisms and universal core concepts in biology. In BIS2B, you will examine ecological and evolutionary processes that shape biological diversity. Finally in BIS2C, you will examine biological diversity in detail. BIS2A is intended to provide you with foundational knowledge in molecular and cellular biology and carry with you throughout your subsequent courses. We will stress important concepts, but will also expect you to learn some of the vocabulary of Biology. This should be fun!

Staff:
The primary instructor of the class is Dr. Kellie Dean, a faculty member at University College Cork. She will be responsible for grading all your assignments in BIS2A. Working with the BIS2A instructors at UC Davis, Dr. Dean has developed a version of BIS2A that takes advantage of the small class size and other resources available at University College Cork. Dr. Igo has been working with Dr. Dean on the class and is listed as the UC Davis instructor of record.

Course Instructor: Dr. Kellie Dean (k.dean@ucc.ie)
Supervising Instructor: Dr. Michele Igo (bis2a-igo@ucdavis.edu)

Discussion TAs: Naomi Hanrahan, BSc Biochemistry, MSc Molecular Cell Biology student
Jenny Duane, Technical Officer, j.duane@ucc.ie

Required Textbooks and Materials*

- No Textbook is required: All required readings are free and will be posted online. You are not required to purchase a textbook for this class.
- Purchase New: Discussion Manual—2019 version of Introduction to Biology Discussion Manual for Biological Sciences 2A. Discussion Manuals from earlier quarters cannot be used. You need to purchase the manual from the UC Davis Bookstore before leaving for Ireland.
- Drawing or Sketch Pad (Plain white paper sheets-no lines-in a binder would also work).
- Recommended Materials: An introductory biology textbook as a reference book. One option is Life: the science of biology, 11th edition, by Sadava, Hillis, Heller, and Hacker. This textbook is used in some sections of BIS2B and BIS2C.
- Do not purchase: Other items found at the bookstore, which might be required for BIS2A sections in other quarters.

* For more detailed information, see p. 4-5 of this syllabus.
Registration for Websites:
You will need to register for two websites for BIS2A. More detailed information about what you need to do will be provided during the first week of class.
- Register for Nota Bene once you receive the invitation.
- Register on Blackboard at UCC for lecture notes, Panopto videos and a discussion board.

General conceptual learning outcomes for BIS 2A
BIS 2A focuses on developing your understanding of several core concepts in biology that can be applied in contexts beyond the boundaries of this course. We expect that once you have successfully completed this course that you will be able to:

1. Apply principles of chemistry and bioenergetics in the context of biological systems to describe how cells acquire and transform energy to fuel various life sustaining processes, including chemical transformations of elemental compounds, cellular replication, and cellular information processing.
2. Explain the relationship between genotype and key genetic processes that create phenotypic diversity.
3. Describe the processes regulating the management of cellular information; how information is stored, read, rearranged, replicated; how cells interact with their environment and how these processes can control cellular physiology.

What you should expect from us:
- We will come to lecture/discussion prepared.
- Our assignments and expectations will be clear and reasonable.
- We will treat every one of you with respect.
- We will give everyone an equal chance to be successful in the course.

What we expect from you:
- You will come to lecture/discussion prepared.
- You will invest the best of yourself in this course.
- You will treat one another and your instructors with respect.
- You will not interfere with each other’s learning.
- You will offer honest feedback on the course.

Student Academic Code of Conduct
Please review the UC Davis policies on student conduct, available online: UC Davis Code of Academic Conduct

Be sure you understand what constitutes misconduct. We send all cases to Student Judicial Affairs – no exceptions. We also may videotape any suspected cheating that occurs during an exam. Some examples of academic misconduct include (but are not limited to):
- Using any sources of information other than your own brain during exams
- Receiving or providing unauthorized assistance during exams
- Altering your exam or assignment in any way after it has been graded
- Plagiarism, fabricating data, or references in any assignment
- Using false excuse to obtain extensions of time
- Distributing copyrighted materials (see below) without permission.
Copyright notice
Lecture slides, study guides, and exam questions are the property of UC Davis and your instructors. Lecture slides also contain copyrighted images that belong to the publishers. You may not distribute lecture slides or exams to anyone not currently enrolled in this class without the instructors’ permission. In particular, posting copies of exams online is a violation of UC Davis policy and copyright laws.

Who should I ask?

General information about the administrative aspects of the course:
This syllabus and documents on the course website provide most of this type of information. For the quickest answer to your questions, we highly recommend looking at the syllabus or the course website before contacting one of the staff.

Generation information related the material presented in BIS2A:
For general information about topics in BIS2A, please feel free to contribute and ask questions to the online discussion board on Blackboard. The discussion board will be moderated by Dr. Dean.

Lecture material and Lecture Nota Bene assignments:
Dr. Dean is the best source of information about the lecture material and any lecture material specific to BIS2A. Dr. Dean will oversee the Nota Bene assignments.

Discussion material and Discussion assignments:
Your discussion TA, Naomi Hanrahan, is the best source of information about the discussion material present in your specific discussion section. Dr. Dean will check in on the discussion sessions throughout the course.

Structure of the Class:
There are four, 2-hour lectures and two, 2-hour discussion sections per week. The lectures will meet from 10:00 AM – 12:00 PM (noon) on Monday to Thursday. The only exception will be the first lecture, which will be held on Wednesday, 19 June from 2:30 – 4:30 PM. All lectures will be in Western Gateway Building (WGB), Room G01.

Discussion sessions will usually meet on Mondays and Wednesdays from 2:00 – 4:00 PM. HOWEVER, there are exceptions to accommodate reviews before the exams. All discussion sessions will be in WGB, Room 3.26, Biochemistry Undergraduate Laboratory. Please note that access to this room is by student ID card only; bring your UCC student card with you.

How should I prepare for lecture and discussion?
The key to doing well in BIS2A is to stay on top of the material. This is a 5-unit class, and we will be covering a lot of material during the next 5 weeks. There is a lot of reading. The best advice is don’t fall behind!!

Lectures: The key to being successful in BIS2A is coming to class prepared. To assist you, we have prepared a pre-study guide and a post-study guide for each lecture. After lecture, you will also be given a copy of the lecture slides and a video/audio (Panopto) will be available, all through UCC Blackboard.

• Before lecture: A pre-lecture study guide will be provided that lists the learning goals for the lecture, the reading assignments, vocabulary words, and some exercises to help you determine if you understand the material. You are expected to come to class prepared to discuss the material
in the reading and to interact with your classmates. It will be assumed that you have read the material and addressed all of the questions in the reading or assigned as “homework” from the previous lecture.

- **During Lecture:**
  In lecture, Dr. Dean will go over the key concepts and provide questions that will allow you to assess your knowledge by participating in discussions with your peers. Although the lecture slides and video/audio will be provided for review on Blackboard, they should not be considered a substitute for attending lecture.

  The discussion with your peers in lecture is a valuable component of this class. Your final grade in this class will only get you so far in the “real world.” In a job interview or an interview to get into a professional school, you won’t be handed a scantron. You will be judged by your ability to discuss biological topics and explain your ideas to another person. In BIS2A, you have the opportunity to practice these skills. Take advantage of it!

- **After lecture:**
  Look at the lecture slides again and pay close attention to the question slides. Without looking at your notes from lecture, write down the answer using correct terminology. Then, look at the post-lecture study guide and the practice questions. Once again, write down the answer using correct terminology. Since the next lecture will build on material presented in this lecture, take the time to make sure you understand the material.

  If you are confused or are not sure how to answer a particular question, return to the reading, lecture notes/Panopto, surf the internet and then try again to formulate an answer. If you still aren’t sure, talk to your classmates about it or go to office hours. The key is to make sure that you understand the material before the next lecture.

**Discussion Sections:** Before each discussion section, you should look over the relevant section of the discussion manual and do the background reading. This will allow you to participate in the discussions with your peers. Some material on the exams will be covered primarily in Discussion section rather than in the lecture. Therefore, make sure that you master the learning goals associated with the discussion section!

**Where can I get help?**

If you are finding the material of BIS2A difficult, please make an appointment by email to see Dr. Dean or Naomi outside of class/discussion time.

Do not wait until the week of the exam to get help. By its very nature, the material in BIS2A is cumulative. Therefore, if you don’t master the learning goals in the early lectures, this will impact your ability to master later learning goals.

**Textbooks and Required Materials:**

- **Textbook and Reading Materials for Lecture:**
  You are not required to purchase a textbook. Most of the required reading will be provided via Nota Bene. This material has been prepared by the BIS2A instructors and you will be responsible for the content of the reading assignments on your exams. In addition, you are expected to read and comment on all of the assigned material before each lecture.

  We also highly recommend that you obtain an introductory biology textbook as a reference.
book. Many of the course reading assignments assume that you are familiar with some basic biological concepts and terminology. You might consider purchasing *Life: the science of biology*, 11th edition. This textbook is used for some sections of BIS2B and BIS2C.

- Supplemental reading may also be provided for some topics on Blackboard. You are expected to read all of the assigned material before each lecture.

**BIS2A 2019 Discussion Manual: Introduction to Biology Discussion Manual for Biological Sciences 2A.**

You must also buy your own copy of the BIS2A Discussion Manual from the UC Davis book store and bring it to Ireland. You will be turning in pages from this manual each week, which will contribute to your discussion grade. Copies of these pages will not be accepted.

**Drawing or Sketch Pad:**

You should also purchase a Drawing or Sketchpad. Sketchpads can be found at the UCD bookstore or many other retailers (between $5-$10). Another option is to use plain white (no lines) paper sheets in a separate section of a binder. Your drawings should all be in one place, not spread out among your notes for the class. If you decide to use a binder, make sure that you bring the entire binder to every class, not just a few sheets of white paper.

If you watch two scientists talking to each other, it doesn’t take long before one of them pulls out a piece of paper to illustrate their ideas. The goal is communication, not to create a beautiful piece of art. We want you to begin practicing this skill. You’ll be asked to make sketches of various concepts throughout the quarter and we’d like for you to have a single organized place to collect this work for your own review, to show your TA/instructor, and to work on in class. Some graded homework assignments will include a drawing. It is also highly likely that you will be asked to illustrate some concept on the exam, so please take these assignments seriously.

**Nota Bene (NB) registration:**

You will receive an invitation to register for the Nota Bene Bis2A Summer 2019 Ireland workspace prior to class. You must register with your name (first and last) as it appears on the roster. This web-based platform will be used for weekly assignments. Nota Bene is an interactive writing platform that allows you make comments and answer questions on a reading assignment by working with your fellow students, TA and instructor. You will be given daily assignments and asked to provide thoughtful commentary and questions. You can see your group’s responses and comment on them. In other words you will participate in a scientific discussion. You can disagree with the paper or a comment, but remember to be respectful in your commentaries. We hope that this will spark good discussions in class.

**Course Grade:**

Your grade will be based upon the following:

<table>
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<tr>
<th>Assignment</th>
<th>Points</th>
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<tbody>
<tr>
<td>Early exam</td>
<td>50</td>
</tr>
<tr>
<td>Midterm exam</td>
<td>150</td>
</tr>
<tr>
<td>Comprehensive final exam</td>
<td>400</td>
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<tr>
<td>Discussion section assignments (20%)</td>
<td>200</td>
</tr>
<tr>
<td>Homework/online assignments/NB/ questions</td>
<td>200</td>
</tr>
<tr>
<td><strong>Total points</strong></td>
<td><strong>1,000 points</strong></td>
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The final grade will be determined by the percentage of the total points you received in the
course: there are 1000 total points. The percentage scale for the different grades is shown on the next page.

**Why are grades assigned on a percentage basis, not on the basis of a “curve”?**

The bottom line is that this means that you are not competing with other students for a grade. The score you accumulate from your exams, discussions, and homework/online assignments will translate directly into your final grade according to this scale. As a result, your grade will be an objective reflection of your knowledge. The percentage scale for the different grades is shown below.

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>From</th>
<th>To</th>
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<tbody>
<tr>
<td>A</td>
<td>93</td>
<td>100</td>
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<tr>
<td>A-</td>
<td>90</td>
<td>92.99</td>
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<tr>
<td>B+</td>
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<tr>
<td>B</td>
<td>83</td>
<td>86.99</td>
</tr>
<tr>
<td>B-</td>
<td>80</td>
<td>82.99</td>
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<tr>
<td>C+</td>
<td>77</td>
<td>79.99</td>
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<tr>
<td>F</td>
<td>0</td>
<td>59.99</td>
</tr>
</tbody>
</table>

For example, if your score is 95%, it means you understood almost all of the material presented in class, and the fact that somebody else got 99% does not detract from your accomplishment. Nothing would delight us more than giving everyone “A” grades. The flip side, of course, is that if everybody gets a poor score, everybody is in line for a bad grade. Therefore, we encourage you to help each other to learn the material, to study together, and to work together on your assignments.

A grade is intended to reflect the level of skill you demonstrate with the material. If you wish to receive a high score in BIS2A, you should strive to understand all the covered material. Please do not ask for a grade beyond what you have earned. The grading policy in BIS2A is intended to be fair and respectful of the needs of all students and we consider requests for special consideration when assigning grades inconsistent with the UC Davis Principles of Community.

“We recognize that each of us has an obligation to the community of which we have chosen to be a part. We will strive to build a true community of spirit and purpose based on mutual respect and caring.” Principles of Community

**Early Exam, Midterm and Final Exam (Total 600 points)**

There will be one early exam, one midterm and a comprehensive final. The exam format will consist of multiple choice and short answer questions (or sketches). Bring a pencil, eraser, and your UCC visiting student identification card to each examination (we provide the scantrons).

The goal of early exam is to provide some initial feedback about your understanding of BIS2A material and give you some practice with the types of questions that will appear on later exams. The mid-term and final exams will have a similar format and will be given in Western Gateway.
Building, Room G05 on the days indicated in the syllabus. The FINAL examination will be held on the last day of class in Western Gateway Building, Room G05. This is the largest room available, so you can spread out to complete the exam. **You must take the exams at the times indicated in the syllabus.** Keep this in mind as you make your airplane reservations and any other travel plans.

The exams will be based on the learning goals, which are presented in the pre-study guide for each lecture. The learning goals draw from the material covered in the lecture, the study questions, discussion section, and assigned readings. A post-lecture study guide is provided after every lecture, which will give you the opportunity to determine if you understand the material from that lecture. Doing well on the exams will demand critical thinking and problem-solving skills. Memorization will NOT be sufficient for a good grade.

**Examination Re-grades:**
We will entertain requests for re-grading of midterm exams based on your submission of a re-grade request (found on the class blackboard site). To request re-grading, submit your graded exam with a written description of the problem or question in concise, clear, and well-organized prose with a completed “re-grade” form. Then, submit the filled-out re-grade form with your exam to Dr. Dean within 3 working days from the date the exam grade was released. We will not process any requests for re-grading after this date. Replies for re-grade requests will be available from Dr. Dean when they are completed. You should communicate with your TA about completed requests.

In order to get your grades out in a timely fashion, there are no re-grades on the final examination.

**Makeup Examinations:**
Make-up examinations for midterms are given at the discretion of the instructor based on University Policy. You should notify the instructor, as soon as it is practical after you miss the exam. You will be required to provide verification for missing an exam, such as a doctor’s note on letterhead, etc. Make-up examinations may consist of an oral or written examination with the instructor and should be scheduled as soon as possible after the original examination date.

**Discussion Section (200 points):**
Materials on the Blackboard provide information related to this portion of the course. There are 10 discussion assignments, each worth 20 points. Part of the discussion sessions will be used as review sessions. **There are no re-grades on the discussion materials.** We drop the lowest discussion activity score. An additional 20 points for participation will be given at the discretion of your discussion TA – so participate!

**NB assignments & Homework (200 points):**
It is worth noting that the total number of points on these assignments is equal to the points assigned to the midterm. Therefore, even though 2-5 points on an assignment doesn’t seem like much, these points add up. Many students, who are unhappy with their grade at the end of the quarter, regret the fact that they didn’t turn in these assignments. The assignments must be submitted by the deadline. **Late assignments will not be accepted.**

**Lecture Reading Assignments on Nota Bene:**
Preparing for lecture is a key aspect of this course. A reading assignment has been prepared for each lecture and will be posted on the Nota Bene website.*
The points will be assigned based on the quality of your comments on these reading assignments. Each assignment is worth 5 points.

- NB assignments will be due at 9:00 AM on the due date.
- Your NB points will be assigned based on the quality of your comments on these reading assignments. You are expected to make at least three (3) comments on these assignments. You will be awarded 5 points for thoughtful comments that add to the overall discussion, various partial credit will be given for less substantial comments, and 0 points for not participating. These points are subjective and at the discretion of the instructor. Please use the opportunity to engage with your classmates on the reading assignment.
  - Comments like: “Yeah, that’s cool. I saw that in high school.” are fine, but do not lead to much discussion and won’t count for much.
  - Definitions for terms used in the course are also fine. However, many students have run into plagiarism issues defining terms. Therefore, be sure to include a reference for any definitions you provide.
  - The best comments are those that show more depth of thought and that may be structured more like “This is interesting. I think X because of Y.” are much better. Replies to those types of comments that point out other questions or inconsistencies/possible misunderstandings etc. are also great! Try to be thoughtful and professional.

Homework Assignments: (Each assignment is worth 5 points)

Homework assignments will also be provided throughout the course. Many of these will take the form of drawings that describe key concepts in the course. Some of these assignments will be uploaded onto the course website. More information will be provided at the beginning of each homework assignment.

Opportunities to earn extra points (Extra credit)

Some opportunities to earn extra points will be given at the discretion of the instructor. These will take the form of additional “extra” questions on the final exam, as well as, designated extra credit assignments. Questions will be based on previously tested material; this is a second chance to demonstrate that you learned the material. The specific amount of extra credit offered on each exam will be at the discretion of the instructor.

In Closing

BIS2A is a team effort. This includes all the instructors at UC Davis and Dr. Dean and Naomi Hanrahan at UCC. The BIS2A team has been involved in developing the course content and syllabus. Instructional scientists are also helping us to develop better instructional methods and new assessment tools. Dr. Dean and Naomi have worked hard to adapt BIS2A, so that UC Davis students have the opportunity to take a required course like BIS2A as a study abroad course in Ireland. Dr. Dean and Naomi are dedicated to helping you do your best in BIS2A and to preparing for your upper division Life Science courses at UC Davis.
Please keep up with your responsibilities as a student. Come to class prepared. Keep current on your studying. Seek out assistance immediately when you need it. If everyone in the class can conscientiously do these things, we’ll all have fun this summer (even while working hard) and be a happy and smarter bunch at the end of the summer abroad!

**LECTURE/DISCUSSION SCHEDULE**

Below is given a tentative schedule of the topics that will be presented in each lecture along with the reading assignment.

All lectures are in G01 Western Gateway Building (WGB); all exams are in G05 WGB. All office hours are in 3.91 WGB – please make an appointment by email k.dean@ucc.ie or after class. There are no set office hours for any academic staff at UCC.

Unit 1: Biological Chemistry  
Unit 2: Energy Transformations  
Unit 3: Cellular Infrastructure  
Unit 4: Information Storage and Flow  
Unit 5: Cell Division

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<thead>
<tr>
<th>Lecture #</th>
<th>Date</th>
<th>Lecture Topic</th>
<th>Reading Modules</th>
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</table>
| 1         | 06/19 Wednesday | Administrative matters & introduction \  
The Cell and the Design Challenge       | 1               |
| 2         | 06/20 Thursday    | Chemistry and Biological Molecules \  
Life’s building blocks: Proteins and Enzymes              | 2               |
| **Disc. 1** | 06/20 Thursday    | *Introduction to Chemistry: Molecular Structure → Function*                      |                 |
| 3         | 06/24 Monday     | Life’s building blocks: Lipids, Carbohydrates, Nucleic acids                   | 3               |
| **Disc. 2** | 06/24 Monday     | *Protein Structure and Function*                                              |                 |
| 4         | 06/25 Tuesday     | Membranes and cytoskeleton \  
Getting biomolecules into the cell: Transport               | 4               |
| 5         | 06/26 Wednesday   | Energetics/Thermodynamics (Dissecting Pathways) \  
Reaction Kinetics; Energy stories                          | 5               |
| **Disc. 3** | 06/26 Wednesday   | *Cell Membranes, Transport, and Structure*                                     |                 |
| 6         | 06/27 Thursday     | **Early Exam (30 minutes)** \  
Oxidation/reduction (Redox reactions) \  
Redox and substrate-level phosphorylation                | 6               |
| 7         | 07/01 Monday       | Electron transport/ATP production \  
Respiration & Photophosphorylation                          | 7               |
<p>| <strong>Disc. 4</strong> | 07/01 Monday       | <em>Redox Chemistry</em>                                                             |                 |</p>
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<th>Lecture #</th>
<th>Date</th>
<th>Lecture Topic</th>
<th>Reading Modules</th>
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<tbody>
<tr>
<td>8</td>
<td>07/02</td>
<td>Carbon Flow: Connecting carbon to energy in heterotrophs</td>
<td>8</td>
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<tr>
<td>Disc 5</td>
<td>07/02</td>
<td>Conservation of Energy in ATP</td>
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<tr>
<td>9</td>
<td>07/04</td>
<td>REVIEW</td>
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<tr>
<td>Disc 6</td>
<td>07/03</td>
<td>Review</td>
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<tr>
<td>10</td>
<td>07/04</td>
<td>Midterm 1 (1 hr)</td>
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<tr>
<td>11</td>
<td>07/08</td>
<td>Constraints on the cell/ Origins of eukaryotes and organelles</td>
<td>11</td>
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<tr>
<td>Disc 7</td>
<td>07/08</td>
<td>What is Life?</td>
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<tr>
<td>12</td>
<td>07/09</td>
<td>DNA structure, replication &amp; recombination</td>
<td>12</td>
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<tr>
<td>13</td>
<td>07/10</td>
<td>Reading information in the genome: transcription</td>
<td>13</td>
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<td>Translation and post-translational processes</td>
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<tr>
<td>Disc 8</td>
<td>07/10</td>
<td>DNA Structure and Replication</td>
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<td>14</td>
<td>07/11</td>
<td>Regulating gene expression</td>
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<tr>
<td>15</td>
<td>07/15</td>
<td>Mutations: Genotype to Phenotype</td>
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<td>Disc 9</td>
<td>07/15</td>
<td>Central Dogma</td>
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<td>16</td>
<td>07/16</td>
<td>Cell Cycle and Cell Division</td>
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<td>Disc 10</td>
<td>07/16</td>
<td>Regulation of Gene Expression</td>
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<td>Disc 11</td>
<td>07/17</td>
<td>Mitosis vs. Meiosis</td>
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<td>18</td>
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<td>REVIEW</td>
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<td>Disc 12</td>
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<tr>
<td>19</td>
<td>07/22</td>
<td>FINAL EXAM Final Exam (2 hrs)</td>
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