2014

410-01 Human Physiology

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“Information is not knowledge or understanding, both of which require objectivity, balance, the view from altitude and interpretation.”

David L. Katz, M.D., M.P.H.

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email: closeje@xavier.edu

We will be using Canvas for communication and posting of information. You should check your email and the Canvas course files regularly for information about the class.

CLASS MEETING TIME: Tuesday and Thursday, 8:30 am-9:45 am


COURSE GOALS: The overall goals for the course are for you to increase your knowledge base and to increase your ability to think scientifically. When you finish this course, you should be able to:
- Understand how physiological systems work individually and in concert to maintain a healthy, living organism in the face of changes in the external or internal environments of the body
- Understand the interdisciplinary nature of biology in general and physiology in particular: physiology is underpinned by the chemical properties of the ions and biomolecules in the body, and must obey the laws you learned in physics
- Interpret, synthesize and apply scientific information

COURSE TOPICS: This course examines selected topics in human physiology that demonstrate how the systems of the body must work in concert to maintain homeostasis. In order to understand how the body maintains a relatively stable internal environment, we will first examine general schemes for control systems, which provide the pattern for the regulatory processes we will study. From these general systems we will progress on to the methods of communication within the body: the cell-to-cell, hormonal, and electrical signaling systems that transmit information from one cell type to another. This provides the basis for our study of the nervous system, using movement of skeletal muscle as a model. We will learn more about the properties of skeletal muscle that underlie our ability to move about within our environment. Finally, we will discuss the system that sustains all the other systems in the body, the cardiovascular system.

READING: You should read the book! The reading assignments for the course are listed on the course schedule on the final page. You will benefit most from reading the material ahead of time, even if you end up reading some material that I don’t cover in class. Reading ahead will familiarize you with the terminology and give you some idea of the processes we will be discussing.

TESTS: There will be four tests including the final exam, which will contain a section of comprehensive questions. In addition, there may be periodic quizzes given at my discretion. (You will be given appropriate notice.) Make-up tests are a privilege that must be earned. (Please see attendance policy below.) If you know you will be missing a test, you must inform me at least one week before the test so that we can discuss your options. (You should have a very good excuse!) If you miss a test without notifying me one week in advance, you may have the opportunity to take a make-up test at the end of the semester.

SPECIAL TESTING NOTE 1: Cell phones and other electronic devices are absolutely prohibited during testing times (and vigorously discouraged at all other times.) If your cell phone, iPod, etc. makes an appearance or goes off, your test/quiz will be confiscated and you will not receive any credit for it.

SPECIAL TESTING NOTE 2: During the testing period, you may not leave the classroom until you have completed your test/quiz (so take care of any personal needs before you begin the test.)
ATTENDANCE POLICY: Of course you know by now the value of attending class. If you demonstrate regular attendance (no more than one unexcused absence or two excused absences), you will have access to the make-up test privilege or the benefit of rounding up to the nearest whole point when grades are calculated.

EVALUATION: Your final grade will be based upon the points you earn during the semester in completing the following requirements:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Percentage of Grade</th>
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<tbody>
<tr>
<td>Tests</td>
<td>85% of your grade</td>
</tr>
<tr>
<td>Quizzes</td>
<td>10% of your grade</td>
</tr>
<tr>
<td>Assigned problems/work</td>
<td>5% of your grade</td>
</tr>
</tbody>
</table>

POLICY ON ACADEMIC HONESTY: This class operates on a strict honor code. Plagiarism and cheating (including the sharing of information on or about quizzes/tests as well as submitting homework answers prepared by someone else) are considered to be violations of this code. The University policy on academic honesty can be found in the online version of the University Catalog. Disciplinary action may range from earning a zero for that work to expulsion from the University. All infractions will be reported to the Chair of the Biology Department and the appropriate college Dean(s).

GRADING: The grading scale for the course is as follows:

<table>
<thead>
<tr>
<th>Exceptional</th>
<th>Good</th>
<th>Satisfactory</th>
<th>Poor</th>
<th>Failing</th>
</tr>
</thead>
<tbody>
<tr>
<td>A: 93-100%</td>
<td>B+: 87-89%</td>
<td>C+: 77-79%</td>
<td>D+: 67-69%</td>
<td>F: Under 60%</td>
</tr>
<tr>
<td>A-: 90-92%</td>
<td>B: 83-86%</td>
<td>C: 73-76%</td>
<td>D: 63-66%</td>
<td></td>
</tr>
<tr>
<td>B-: 80-82%</td>
<td>C-: 70-72%</td>
<td>D-: 60-62%</td>
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</tbody>
</table>

FINAL EXAM INFORMATION: Date: Thursday, December 18, 2014 from 3:00pm until 5:00pm (Location TBA). Your final exam will cover new material and have a comprehensive section reviewing and integrating material on previous exams.

SPECIAL DAYS!

<table>
<thead>
<tr>
<th>M</th>
<th>9/1</th>
<th>Labor Day: No classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>9/11</td>
<td>Quiz 1</td>
</tr>
<tr>
<td>R</td>
<td>9/25</td>
<td>Test 1</td>
</tr>
<tr>
<td>T</td>
<td>10/9</td>
<td>No class-Fall Holiday</td>
</tr>
<tr>
<td>R</td>
<td>10/23</td>
<td>Test 2</td>
</tr>
<tr>
<td>T</td>
<td>11/20</td>
<td>Test 3</td>
</tr>
<tr>
<td>M</td>
<td>11/24</td>
<td>Last day to drop a class</td>
</tr>
<tr>
<td>W</td>
<td>11/26</td>
<td>Thanksgiving Holiday begins</td>
</tr>
<tr>
<td>R</td>
<td>12/18, 3:00-5:00pm</td>
<td>Final Exam: Location TBA</td>
</tr>
</tbody>
</table>

PLEASE NOTE: These course policies, procedures and schedule are subject to change in the event of extenuating circumstances or at the whim of the professor (although she tries not to have whims too often!)

This course meets NSTA Reporting Standards: 1a, 1b, 3a, 3b for teaching science.
PLANNED COURSE TOPICS FOR THIS SEMESTER*:

- Homeostasis is the maintenance of a relatively stable internal environment in the face of changes in either the internal environment, external environment, or both. What are some of the basic processes that must be in place in order to maintain homeostasis? [Silverthorn, Ch. 1 (pp. 2-14)]
  - Fluid compartments in the body: regulation of fluid composition [Ch. 1 (11), Ch. 3 (63-65)]
  - Cell membrane dynamics [Ch. 3 (65-69), Ch. 5 (130-134, 139-154)]
  - Cell membrane potential [Ch. 5 (160-166)]
  - Communication: Cell-to-cell signaling [Ch. 1 (15), Ch. 6 (175-192)]
  - Control system mechanisms [Ch. 1 (14-20), Ch. 6 (192-201)]

- To respond to changes, notice of that change must be delivered to the appropriate locations in the body. How does this communication occur?
  - Endocrine system: Classification of hormones [Ch. 7 (207-216)]
  - Control of hormone release [Ch. 7 (216-224)]
  - Hormone interactions [Ch. 7 (225-230)]
  - Nervous system cells and signals: Graded potentials, action potentials [Ch. 8 (238-266)]
  - Synaptic transmission [Ch. 8 (266-281)]
  - Maintenance of homeostasis: autonomic function [Ch. 11 (378-391), Ch. 13 (444)]

- Sometimes the body’s response to a change requires movement. How is this movement coordinated?
  - Somatic motor activity [Ch. 11 (391-393)]
  - Neuromuscular junction [Ch. 12 (410)]

- The body carries out both voluntary and involuntary mechanical activity, utilizing three different types of muscle. What is the contribution of each of these muscle types?
  - Skeletal muscle function [Ch. 12 (399-421)]
  - Smooth muscle function [Ch. 12 (426-435)]
  - Cardiac muscle function [Ch. 14 (475-482)]

- The cardiovascular system provides the support for all of the other processes, homeostatic or not, to occur. How is it able to provide continual support as the needs of the body change? [Ch. 14 (463-466)]
  - Physical properties operating in the cardiovascular system [Ch. 14 (466-470)]
  - Electrical activity of the heart [Ch. 14 (483-489)]
  - Pump function of the heart: cardiac cycle [Ch. 14 (487-495)]
  - Control of cardiac output [Ch. 14 (495-501)]
  - Blood vessels: distribution of blood flow and regulation of blood pressure [Ch. 15 (509-528)]
  - Exchange of materials in capillaries [Ch. 15 (528-533)]

*We will move through the material quickly or slowly depending upon my sense of the level of your understanding. This means we may or may not make it through all of the topics listed. As students, you have some level of control over this; keep up with learning the material and we can make it through the entire list. 😊
ADDITIONAL PIECES OF INFORMATION TO HELP YOU WITH LEARNING

HUMAN-BASED:

-Professor: I will be available to help you during my office hours or via appointment. You are always free to drop in; if I can’t help you right then, we’ll set up a specific appointment. I will also hold review sessions before each test, usually two evenings before the test (since the night before a test is really too late.) I have also posted some information on Canvas about techniques for learning based upon different learning styles.

-Student: you are ultimately responsible for learning the material. I strongly recommend that you practice the following:

General Study Practices for Physiology: How to work more efficiently and learn more effectively

Here are some strong recommendations for practices that will help you understand and learn the material in this course. Students who have done well in my course in the past (there are many who have!) have used these ideas as well as created some of their own. (Use of these is not restricted to this class only, in fact, they will be useful in virtually any class you take, so empower yourself with them!)

1. Determine your learning type. Notice that I placed this ahead of reading the book! Having some understanding of your learning type is critical, as it will help you figure out how to most efficiently study. If you are an auditory learner, then reading and re-reading your notes will be of little value! The Learning Assistance Center offers a self-graded questionnaire that helps you to determine your learning style.

2. Allow yourself enough time to learn. You’ll notice that I didn’t say to memorize, but to learn. You cannot do this if you wait until just before the exam to study. Rule of thumb: two hours out of class for every hour in class, BUT this does not mean that all of the hours should occur in the two days before the exam. You can try it, but your chances of a successful outcome will be greatly diminished! You couldn’t learn to play a great game of basketball by only practicing for the two days before the big game. It’s all about training neurons!

3. Keep the BIG PICTURE in mind. I’ll keep reminding you in class, but you should also remind yourself as you are studying. If you do this, it will help you figure out how things work! Determine whether it is better for you to learn starting with memorizing language, or to start with the big picture and work your way down to the details. In this class, it’s usually the latter that is most effective.

4. Read the book. You knew it had to be here! Read over the material before you come to class. You don’t have to master it all, just be familiar with the topic being covered. It will help you get more from and contribute more to the class discussion, I promise. (Remember that participation portion of your grade!)

5. Learn the terminology. (The only place where memorization will help you in this course!) Every discipline has its own language. You must know this language in order to understand how processes work, plus, as you search for and write down definitions, you are learning. I would recommend looking within the body of the book for definitions as it keeps you in context, rather than the glossary or a dictionary. You could make flash cards (just don’t write two volumes in microprint on the back side of the card—that’s not the purpose of the flash card) or simply list and define terms on a sheet of paper. Make up a poem, write a song, draw a picture, whatever it takes to help you remember the terms.

6. Understand the concepts. This is harder and takes more time, because you have to learn how things work, either separately or with other processes and systems

   Understanding the process: You can help yourself by creating a process chart, where you list all the steps in a process. It is especially helpful to write each step on a single index card. (Nothing on the back-it’s not a flash card in that sense) Then shuffle the cards and see if you can recreate the process. (Wouldn’t you rather play cards, even physiology cards, then read and re-read your notes to memorize them?) You can then use these cards over and over to learn the material, and check your knowledge with them as you are preparing for an exam. If you can’t make it through the process correctly, say, you can get to step 4 but not step 5, then you know exactly where your gap in understanding is.

   Understanding how processes and systems work together: This is really a matter of organizing the material in a way that makes it clearer for you how things are categorized and how they are connected. Organizational (flow) charts and concept maps are excellent for this, plus, they place the material on which you’ve taken pages of notes into a clear and condensed organizational scheme. We’ll do examples of these charts in class, so you can see what I mean.

7. TEST YOURSELF to see if you really do understand the material. Many, many student have come to me and told me that they didn’t understand why they didn’t earn the grade they wanted on a test. The conversation generally goes something like this:
Janie Student: “Dr. Close-Jacob, I just don’t understand it. I studied really hard for the exam and thought I knew the material really well. Then I took the exam and did awful. My score definitely doesn’t show how well I knew the material.”

Dr. C-J: “Well, Chris, did you do anything to test yourself to see if you knew the material?”

Janie S.: “Well, I read the notes over and over.”

Dr. C-J, puzzled: “But how did you know that you knew the material?”

Without self-assessment, you cannot really know whether you know the material or not. The test is definitely not the place to do this. Here are some ways to work self-assessment into your studying.

Answer the questions in the book at the end of each chapter.
Use the CD-ROM that came with the book to review.
Go online to www.MasteringA&P.com and take the quizzes. They’ll grade them and give you immediate feedback.
Create a study guide for each chapter.
Write some multiple choice questions for your own use in learning the material. Write the questions as you are studying, then pull them out for review. This sounds kind of strange, but it does work. To write a good multiple choice question, you have to have the question and its answer in mind, but you also have to know why the wrong answers are the wrong answers. Trust me, this works!

8. Work with others. You never learn something better than when you have to explain it to someone else. So you may benefit from reviewing with a study buddy or group, where you can ask each other questions and/or check your understanding of the material.

**TECHNOLOGY-BASED**

-Interactive Physiology CD-ROM: bundled with your textbook or passcode is available for purchase separately.
-Web Sites: I have listed a few web sites that may be useful/of interest to you over the course of the semester. If you find others, please let me know and I’ll add them to the list.

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<thead>
<tr>
<th>Web Site</th>
<th>Description</th>
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<tbody>
<tr>
<td><a href="http://www.MasteringA&amp;P.com">http://www.MasteringA&amp;P.com</a></td>
<td>Web site from your textbook publisher offering some different ways to learn: case studies, quizzes, glossary terms, and more. If you did not receive a password with your text, there is a way to purchase access to the site. See me for details.</td>
</tr>
<tr>
<td><a href="http://www.nlm.nih.gov">http://www.nlm.nih.gov</a></td>
<td>Web site of the National Library of Medicine; from this site you may access other interesting sites and/or useful sites such as: MEDLINE: the major database used for tracking medical research. You can search it from the web using either of two systems: Internet Grateful Med or PubMed or access full capability from our library site. The Visible Human project: human serial dissection</td>
</tr>
<tr>
<td><a href="http://www.scholar.google.com">http://www.scholar.google.com</a></td>
<td>Search engine-useful for finding scientific research articles; check <a href="http://www.google.com">www.google.com</a> for useful images (be sure to credit source if you use them)</td>
</tr>
<tr>
<td>Almost any medical school site will have useful information, as do some of the major hospital sites (Mayo Clinic, Cleveland Clinic)</td>
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