

Human Physiology (Biol 2420-2) Spring Semester 2021

GENERAL INFORMATION

Instructor: David H. Temme

Office: Bldg. 44 Room 217, Phone 801-581-8897 (Note: Neither will be used this semester)

E-mail address: temme@biology.utah.edu

Office hours: While I am happy to meet with any student, I have found that regularly scheduled office hours are not the best way to facilitate such interactions. So instead, note that right after each class I am always available for brief discussions. Alternatively if more time is needed, please contact me to set up another time that works for both of us.

Important note: For Spring 2021, Biology 2420-1 is being offered as an **Instructional Video Conferencing (IVC) class**. Class sessions will be held at the scheduled times via Zoom. Quizzes and exams will also be handled online. Participation in the course will depend on having access to a computer and a broadband internet connection, as well as being able to use Canvas, Zoom and other online resources effectively. Please contact the instructor as soon as possible if you have concerns about these requirements.

Teaching assistants: (tentative) Hiroshi Aoki, Arianna Birch, Anna Bradford, Marcus Brauer, Elaina Briscoe, Jake Christensen, Drue Domagala, Stormy Foster, Paul Gramer, Madeline Harker, Hannah Harman, Samuel Hoyt, Gabrielle Jensen, Maya Langenecker, Sydnee Lefler, Zachary Mallender, Jamie McDowell, Denver Rawlings, DJ Sorenson, Sarah Trela-Hoskins,

Note: Historically, creating extensive opportunities to interact with TAs has played a very important role in my classes. In this on-line universe we will attempt to continue that tradition, with the major difference being that instead of meeting in the 1st floor study areas in South Biology, or the Group Study Area on the third floor of Marriott Library, we will meet via Zoom. We will begin to schedule Zoom times early in the semester, and hopefully by the end of the first or second week a more fixed schedule will take form. Furthermore, if you feel additional individual or small group interactions would be useful, please feel free to contact either me or one of the TAs, and we will try to arrange a time.

Recommended Text: Human Physiology: An Integrated Approach (8th, 7th, 6th, or 5th editions) by Dee Silverthorn, Pearson Education, Inc. This class does not follow this textbook per se, hence it is not a required for the class. Yet I still include a recommended text just because it is a single source that may prove to be a useful reference to further read about topics discussed in class. However, as long as you are willing to discriminate, it is also the case that in an online world alternative sources are also available that can serve that same purpose. I am simply trying to provide options and let students decide what will work best for them.

Class lecture outlines: The course is structured around an extensive series of lecture outlines (which will be made available on the course web site). Lecture outlines contain both pictures and some text organized in a way to help you take notes during “class” discussion of the related material. In essence, we will build a physiology manual. Historically, students have either taken notes on hardcopies that they print out in advance and bring to class, or on a portable computer that allows writing on pdf files. Given that class material will either be covered via synchronous zoom sessions and/or prerecorded videos, you will need to figure out what works for your situation.

Course web site: Access to different types of course handouts is available through the University of Utah’s Campus Information System (CIS). To access the course website log into CIS, click on “Go to This Class” for Biol 2420. From there you can access the course syllabus, as well as all other course materials.

University Policies:

• ***The Americans with Disabilities Act.*** The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, (801) 581-5020. CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in an alternative format with prior notification to the Center for Disability Services.

• ***University Safety Statement.*** The University of Utah values the safety of all campus community members. To report suspicious activity or to request a courtesy escort, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit safeu.utah.edu.

• ***Addressing Sexual Misconduct.*** Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS).

• ***Names/Pronouns.*** Class rosters are provided to the instructor with the student's legal name as well as "Preferred first name" (if previously entered by you in the Student Profile section of your CIS account, which managed can be managed at any time). While CIS refers to this as merely a preference, I will honor you by referring to you with the name and pronoun that feels best for you in class or on assignments. Please advise me of any name or pronoun changes so I can help create a learning environment in which you, your name, and your pronoun are respected. If you need any assistance or support, please reach out to the LGBT Resource Center. https://lgbt.utah.edu/campus/faculty_resources.php

• ***Campus Safety.*** The University of Utah values the safety of all campus community members. To report suspicious activity, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit safeu.utah.edu.

• ***Wellness.*** Personal concerns such as stress, anxiety, relationship difficulties, depression, cross-cultural differences, etc., can interfere with a student's ability to succeed and thrive at the University of Utah. For helpful resources contact the Center for Student Wellness at www.wellness.utah.edu or 801-581-7776.

• ***Diversity / Inclusivity.*** It is my intent that students from all diverse backgrounds and perspectives be well served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. It is my intent to present materials and activities that are respectful of diversity: gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture. Your suggestions are encouraged and appreciated. Please let me know ways to improve the effectiveness of the course for you personally or for other students or student groups. In addition, if any of our class meetings conflict with your religious events, please let me know so that we can make arrangements for you.

• ***Veterans Center.*** If you are a student veteran, the U of Utah has a Veterans Support Center located in Room 161 in the Olpin Union Building. Hours: M-F 8-5pm. Please visit their website for more information about what support they offer, a list of ongoing events and links to outside resources: <http://veteranscenter.utah.edu/>. Please also let me know if you need any additional support in this class for any reason.

• ***English Language Learners.*** If you are an English language learner, please be aware of several resources on campus that will support you with your language and writing development. These resources include: the Writing Center (<http://writingcenter.utah.edu/>); the Writing Program (<http://writingprogram.utah.edu/>); the English Language Institute (<http://continue.utah.edu/eli/>). Please let me know if there is any additional support you would like to discuss for this.

TENTATIVE OUTLINE OF LECTURE TOPICS:

BACKGROUND (each covered in pre-recorded videos) Relevant Chapters: pp. 8th ed. (7th ed.) (6th ed.) (5th ed.)

A first look at forming a “cell”	(3)
Chemistry: Some starting details	(2)
Cell basics	(3,5)
Chemical reactions	(2,4)
An overview of cell macromolecules	(2,4)
An overview of how cells “power” macromolecule synthesis	
More on using ATP	(4)
Making ATP	(4)
A brief overview of different cell types	

GENERAL FEATURES OF ANIMAL PHYSIOLOGY

Becoming multicellular	
Cell perspective physiology	(1)
Organism perspective physiology	(1)
Membrane potential	(5)
Intercellular communication	(6)
An overview of nervous and endocrine systems	(7&8)

COORDINATING MOTION

Action potentials	(8)
Nervous pathway basics	(8, 11 pp. 368-371 (371-375) (391-395) (396-401))
Muscle cells: basic features	(12)
Overview of spinal cord organization and reflex arcs	(9 pp. 272-282 (275-285) (289-299) (297-307), 13 pp. 415-423 (418-426) (442-452) (447-458))
Overview of brain organization	(9 pp. 282-302 (285-304) (299-319) (309-326))
Sensory physiology: sense to image	(10)
Sensory physiology: sensation	(9)
Memory: connecting image and sensation	(9)
Basic motor pathways	(13 pp. 422-428 (426-431) (452-458) (457-463))
Overview of cerebral cortex organization	(9)

CIRCULATION

Some physics of flow	(14 pp. 433-440 (436-443) (463-471) (468-475))
Maintaining blood flow through capillaries	(15 pp. 477-495 (478-496) (509-528) (513-526))
The heart as a pump	(14 pp. 440-471 (443-473) (471-502) (476-505))
Microcirculation and the lymphatic system	(15 pp. 495-504 (496-505) (528-538) (526-540))
Blood cells and blood clotting	(16)

INPUTS AND OUTPUTS

The kidney’s role in maintaining some forms of balance	(19, 20)
Maintaining oxygen and carbon dioxide balance	(17,18)
pH and potassium balance	(20)
Designing a digestive tract	(21)

Digestion and absorption	(21, 22)
Regulating blood levels of glucose and calcium	(22, 23)
The input and output of viruses and bacteria	(24)

REPRODUCTION

Regulation of growth and development	(23, 26)
Mating, fertilization, implantation, and birth	(26)

TESTING

In recent semesters I have given 6 quizzes (40% of grade), and 3 exams (60% of grade). The major purpose of the quizzes was to provide continual feedback on each student's developing ability to understand and work with a selected subset of concepts that form the foundation for all the various topics we will discuss, along with keeping students abreast of the associated terminology. In contrast, the exams were both more comprehensive and more application-based. In this class I introduce and continually reinforce a small set of patterns that can help make sense of a lot of information, and a part of every exam challenged students to apply their understanding to novel situations.

Overall, my goal was to use these various forms of feedback to encourage students to break free of just trying to memorize enough information to survive the next "exam", and increasing trust in their ability to developing a more foundational understanding.

The reason I bring this up is that while my basic goals are not changing, I sense that the same pattern of evaluations would not work as well in an online environment. What would be a better choice? At the end of spring semester, as well as all of fall semester I gave either weekly or biweekly quizzes outside of class time. The reasoning behind this decision was summarized in the following student comment: "Without the support generated by regularly scheduled meetings with classmates, TAs, (and the "teacher" as well), maintaining the motivation to keep up is more challenging. While not a substitute for social support, more frequent quizzes seemed to help by both providing an ongoing schedule of tasks, as well as making the tasks at hand seem more manageable." However, without going through all the reasons for doing so, I am going to make some modifications to that scheme.

First off, I am going to give five application-based exams during the course of this semester, so one every three weeks. All exams will be given on Mondays, which means that on February 8, March 1, March 22, April 12, and May 3 during the synchronous class time (with the exception of the May 3rd exam which is scheduled by the university to take place between 8 am to 10 am). Each exam will be proctored via zoom connections. Being able to take these exams at these scheduled times is the one mandatory requirement for participation in this class.

The other aspect of feedback that I plan on trying this semester is to give are-you-keeping-up-with-the-basic-information type quizzes consisting of no more than 10 straightforward true-false (or perhaps multiple choice) questions either once or twice a week that students would be given around 15 minutes to complete during some window of time outside of class. At the moment, I envision opening the quizzes early in the morning every Tuesday (on non exam weeks) and Thursday, and close them prior to class. (Although that plan is not set in stone, as it may make sense to make slight adjustments to that schedule.) These online quizzes will be open note, but as mentioned above, time-limited.

GRADING

It is one thing to generate various forms of evaluations that can be converted into points recorded on a grade sheet, and quite another to figure out how these numerical measures of each of your collective performances is best converted into grades. The challenge with grades is that individuals across some range of numerical performance are all given the same grade. (Note: one of the most vehement complaints I have ever received about grade came from someone who had done considerably better than his friend, but had received the same grade. It turned out that one student was near the top of a particular grade range, and the friend was at the very bottom.) I presume that like every past class the numerical performance will fall across some distribution, yet given that I am trying new things I do not have past experience to

guide future expectations. Thus, it seems best to have the distribution in hand before setting up the final grading scales. Although I will guarantee that the grading scale will not go any higher than the standard 90-80-70... percent scale. That is 90% and above is the A range (which includes A and A-), 80 to 89% is the B range (which includes B+, B, and B-) and so on.

But let me outline some guidelines that I will use in setting up grading scales:

First, I will establish two grading scales, one that includes only your performance on the five exams, and one that combines your performance on exams (67% of grade) and quizzes (33% of grade), and give you whatever scale yields a higher grade. Another way of seeing this is that taking quizzes is optional. If you do not want to deal with the constant demand of taking one or two online keep-up-with-the-material quizzes each week, then you do not have to. Your grade will be based solely on your exam performance.

Second, each of the two grading scales will not be numerically the same (as I assume that the overall average on exams will be lower than the exam plus quizzes), but each will be centered around a grade distribution where the median score falls in the same grade range. Historically, the final grading scale has had the median score fall in the B- range for those completing the course. While I always recognize the possibility that a class's cumulative score distribution could be unique in ways that aligning grade distribution with past classes would not make sense; barring such exception, I will create a grading scale that largely standardizes across-class comparisons.

Third, (and this is new) the grading scale will not include C minuses, or D pluses. One of the frustrating aspects of assigning grades is that each of you entered this course with different backgrounds, hence varying levels of preparedness. As a consequence, your final grade cannot provide meaningful feedback on how much your abilities improved throughout the course. The only person that can meaningfully measure that is you, but only if you are willing to be completely honest with yourself in terms of where you started this quest, and how much your ability to think about new things in new and meaningful ways has changed from that starting point. On the other hand, if a course and its associated evaluations are set up in a relevant and meaningful way, I do believe that grades can provide meaningful feedback on how ready you are to move to next-level courses (or other forms of next-level challenges). And having access to such feedback is important in terms of helping each of us plan our best educational path.

But, grades are also used to either permit or deny access to other classes, which in principle seems fine, but in practice poses challenges. In particular, I highlight the line between a C and a C- grade. As anyone who has ever had to assign grades knows, one has to create thresholds where everyone above some line gets one grade, and everyone below gets another. While this can seem unfair to individuals that fall just below any threshold, across many classes it is likely balanced by instances of just being above some threshold. But the C to C- line has come to have even greater significance in that it has commonly become the grade line where students getting a C or above are allowed to enroll in next level classes, while those getting a C- or below are not. Yet given the nature of all thresholds, in at least some instances the overall difference in the class performance between students getting a C or C- could be relatively minor. Given that, I have decided against assigning any C- (Or D+) grades. I will simply extend the C range to as low as I can, and still feel like the student has demonstrated enough understanding to potentially move on and succeed in next level classes/opportunities. Of course, at some point I will still draw a line, but it will have to be at a point where it feels justified to begin assigning grades that prevent the opportunity to move on to next level classes (either D's or E's). So, if you get a C in this class, please understand that you are getting feedback that you may not be in a place where you are well prepared to move on to next level classes, but you will get to choose whether or not to take on that challenge.

MAKING UP EXAMS/QUIZZES

There are **only** two circumstances under which you will be allowed to make up one of the five exams that you did not take during its scheduled time:

- You have spoken to me prior to the time that the exam was scheduled, and I agreed that your reason for missing is legitimate.
- There is a verifiable reason that accounts both for why you were unable to contact me prior to the exam and for why you were unable to attend the exam at its scheduled time.

IN ALL OTHER CASES YOU WILL RECEIVE A ZERO FOR THE EXAM.

On the other hand, given the relatively large amount of short information-based quizzes that I intend to give, I plan on dropping a few of the lower quiz scores for everyone before calculating the quiz portion of the grade. Given that, except in exceptional circumstances, I do not plan on allowing quiz make ups. If you miss a quiz, it will be simply one of the quiz scores dropped.

WITHDRAWALS AND INCOMPLETES

Friday, January 29 and **Friday, March 12** are two days to be aware of. Up to January 29 you can drop this course. After January 29 and up to March 12 you can withdraw from this or any other course you are taking this semester. Withdrawal, in essence, is a means to decide to not complete the course and still avoid receiving a failing grade. Instead a W appears on your transcript. To withdraw just go to the registrar's office and fill out the necessary form. Continuing the course past March 12 is to make the decision to complete the course.

A student may receive an incomplete if (and ONLY if) that student has taken a majority of the online quizzes and because of extenuating circumstances is unable to complete the course. To finish an incomplete, the student will be expected to make up whatever was missed as soon as possible.

LEARNING OBJECTIVES

The answer to the question: What should I do in a human physiology course? seems so obvious—I should introduce what is known about human physiology. Typically this is done by starting with a brief introduction to cells and tissues, and then moving through the basic features of each of the body's systems (i.e., nervous, circulatory, digestive, immune, etc.)

The problem is that information surveys tend to never get to the root of an educational experience—to literally reshape the brain in ways that makes it possible to not only repeat information but to better think, question, and organize it. And that is not likely to happen in the absence of guidance.

So my goal in this course is to attempt to guide students through an exploration of physiology that will help them see patterns nested within its workings, which in turn will facilitate the building of a mental framework that will allow them to better think about any aspect multicellular function. Aspects of this goal include:

- helping students view each new piece of information as more than another thing to be memorized, but as something that fits into a network of core ideas.
- helping students discover how to apply core ideas to figure things out for themselves. Only then do students escape the trap of making everything a special case. And when that starts to happen, it begins to be fun. Education in its truest form is enticing.
- helping students go beyond their own expectations, and understand “things” that they never thought they could.

While these goals may seem (ambitious, unreasonable, esoteric, or whatever word you want to fill in here), the bottom line is that I am trying to help students prepare for upcoming challenges. I feel confident that any student that strives to make continual progress is on the path to excel in future studies (in whatever form they pursue). The extensive feedback I have had from former students continually reinforces this belief.

There is one important caveat to consider: While I am commonly referred to as a “teacher”, recognize that it is a poor word choice. No one can teach anybody anything. That is, I cannot transfer any information, ideas, or understanding to anyone, they have to learn them. And learning is an active, engaged process of discovery, whose route starts with confusion and proceeds through struggle. So unless a student is willing to take on the challenge, which involves effort and participation, nothing will happen. My job is to help guide that discovery as best as I possibly can. My hope is that each student comes with the energy needed to embark on a journey.

COMMENTS FROM PREVIOUS STUDENTS:

It is very important to attend lecture all the time or you miss the concepts. The book doesn't present things how they are presented in class—with the WHYs. If you miss a lot of lecture, it makes things really frustrating because you miss

important pieces that cannot be gotten just from reading the book.

Physiology Truths... (found on the back of a vocabulary quiz)

Life is loopy (and so is your brain after you study too long).

Diffusion is slow (especially at the start of a big marathon)

Embrace confusion (even when your arms get tired from the “sustained hug”)

Keep up (even when you’re failing your other classes, getting two hours of sleep, and neglecting your hygiene)

When in doubt, the liver produces it.

Always enter Dave’s class ready to laugh because whether Dave shares his jokes with you or not, he’s always entertained and makes physiology entertaining.

Some student answers to the question: What advice would you give students taking this class from me next spring semester?

Take biology and chemistry before taking this class.

Have a biology background and a basic understanding of anatomy.

Take an introductory biology class if it has been a while since you have taken a biology class.

Drop now if you do not have the background.

Always come to class and look for patterns.

Try not to get behind—it’s no fun to try to cram all the info right before a test. And look for connections—this class is so loopy it can make you dizzy.

Come to class everyday, the information covered in class is very different from what is in the book.

Do not procrastinate, study daily.

Main thing: Stay up to date and don’t get behind. You cannot successfully “cram” for a Temme test.

Don’t miss a day and attend on Fridays (even if there is no class, its a good review session).

STUDY, don’t take your normal full-load of credit hours, and don’t take for granted that you will “naturally” do well.

The man goes a little fast—you must come to every class, even if you are sick and dying. Study each week’s handouts constantly, not just before a test.

Keep up as everything builds on everything else.

Read ahead in the some physiology book about the subject Dave will talk about if you have time.

Read the chapters as often charts and diagrams help that aren’t in handouts or presented in class.

Give it your best... then you will never wonder “what if”.

Take good notes to correspond with the drawings in the handouts.

Link concepts; try to apply the things you’re learning to real life.

It’s okay to trace your food, urine, and well other stuff. Great way to learn despite all the weird looks you get from other people.

Don’t think in the way that you have been throughout “traditional education”—put yourself outside the box and think more abstractly.

Try to not be stubborn-minded about Dave’s style of teaching—it will get you nowhere by just memorizing information.

If you don’t get it, go over it until you do. You can apply what this class teaches you to anything.

Go over lecture notes immediately following lectures and ask questions!

Ask questions and be involved in the discussion.

THINK!

Learn how to think, consider, probe, and question every thing you learn or hear from Dave and other professors.

First learn everything, then be sure you can put it all together and make connections.

Use the notes and study questions as a source of learning, but make sure to understand the concepts so that you can apply them.

Don’t just memorize—it won’t help on exams.

Be prepared to think like Dave and figure out everything about each concept to be able to answer any related questions on tests.

Try to think about the big picture.

Always ask: How can I tie this all together and why is this like it is?

Just learn to look for the general patterns and to always ask why things are happening.

Think of why things are happening more than how. The how is easy, it is the why that tends to go unanswered.

Have fun and enjoy this class. Don't make it harder than it really is.

Have fun, this class rocks.

Get out fast!!!!

Good luck and pray.

"Get out while you still can!!" Just kidding—just keep up with the material and don't get behind.

When taking a test, relax and apply what you know.

His tests are like a box of chocolates, you never know what you're going to get. So eat the whole box before the test.

Then go buy three more boxes and eat them before the test.

If you know all the answers to Dave's questions, then sit in the front row because it is annoying when you mumble every single answer from the back row when Dave can't even hear you.