

Human Physiology (Biol 2420-1)

Fall Semester 2023

GENERAL INFORMATION:

Instructor: David H. Temme

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

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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.

Basic class structure: For fall semester 2023, Biology 2420-1 is being offered as in-person class that meets from 3:05 to 5pm twice a week (Monday and Wednesday). As such, being able to attend class is mandatory for the five exams (Monday, Sept 11; Monday, Oct 2; Monday, Oct 30; Monday, Nov 20; Wednesday, Dec 13) and strongly encouraged for all other class—as through further discussion of class material, the goal is to make very productive use of that time. Specifically, while the initial introduction will take place at your convenience (on prerecorded videos available on the Canvas class web site), I will focus class time on how to build a framework that allows you to better understand, hence effectively utilize, the material. Exploring that next level is where education begins to take root.

Participation in the course will also still 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. As mentioned above, the Canvas class web site contains all the initial discussions of course material on prerecorded videos, along with accompanying lecture outlines (discussed further below). Furthermore, all quizzes (likely 3 per section, or 15 in total) will also be given in an online format, and some TA sessions may take place over zoom.

Teaching assistants: Lauren Cook, Ivan Delgado, Nicole Holden, Sydnee Lefler, Paige Noble, Yuki Sabo-Yamanouchi, Sam Tenhoeve, Hannah Wilson, Liam Wallis

Note: Creating extensive opportunities to interact with TAs has always played a very important role in my classes. Prior to Covid, the sessions were held at regular scheduled times in the 1st floor study areas in South Biology, or the Group Study Area on the third floor of Marriott Library. During the past two semesters, all the scheduled TA sessions were held using Zoom. In this coming semester, the hope is that we can do a mixture of both in-person and Zoom sessions. But how that schedule will work out, or whether we will need to make adjustments during the semester, are questions I cannot answer at this time. What I do know is that by the end of the first week a more fixed schedule will begin to 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 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 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 are 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, or on a portable computer that allows writing on pdf files. Given that class material will be covered initially via prerecorded videos, and then discussed further during the in-person class sessions, you will need to figure out what works best 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.

The nature of this course: It is important that every entering student recognize that Human Physiology is a second-level biology class. By second-level I am referring to the fact that this class has prerequisites (both an introductory college-level biology and chemistry class), and by biology class, I mean that this is a course taken by many biology majors as part of their core coursework (as well as students from other majors that focus on some aspect of the study of life). As such, the goal of the course is not to be hard, or to be easy, but to be effective in terms of providing a meaningful opportunity to improve one's ability to think about multicellular/animal/human function.

Furthermore, the "second-level" nature of this course is an implicit assumption that this is a continuance of a journey that you have already started. That is, that topics such as basic aspects of cell function or chemical reactions are already part of your intellectual/conceptual tool kit, so we can continue to build from there.

In attempt to help each of you make sure you are starting on relatively solid footing, I made a series of prerecorded videos (again accompanied by packages of lecture notes) that highlight some of basic aspects of biology and chemistry that are foundational for this course. So as a course preface, I encourage you to spend a few hours before the semester starts going through the six videos now available on the course canvas web site (seven in you include the common sense toolbox video, which would be worth viewing prior to class starting). These videos can serve two important purposes. First, they provide an opportunity to review some background topics particularly relevant to this course. (Note: the presumption is that most topics will have been addressed in your prerequisite courses. The one likely exception is the discussion of "the most important chemical reaction in biology" addressed in the macromolecule synthesis video. So there, just listen and see if the basic idea makes sense.) Second, they can help you assess whether your background has adequately prepared you for this class. If the material in these videos seems relatively new or unfamiliar, let that serve as a "red-flag" that you may not be ready to take on this course **yet!** (Note: I view "not yet" as one of the most important ideas in education. It does not preclude the possibility of anyone assembling a meaningful understanding of anything, but simply recognizes that such mastery is a building process in which each new step or insight depends on first assembling whatever foundational understanding is needed.) Which raises the question, if you find yourself in a "maybe not ready" position, what should you do? One option, of course, is to stay in the course with the recognition that you are going to need to work extra hard right from the beginning to catch up. And if you are willing to take on that challenge, feel free to contact me, and I will try to align you with a TA willing to assist you. On the other hand, you may want to opt out of the course this semester, and focus on building a stronger foundation via your other courses before enrolling. The one choice that I cannot recommend is to continue on with the mindset that being inadequately prepared will not play any major role in your ability to navigate the challenges of this course. My experience (over a lot of years) suggests that will not likely prove to be accurate!

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

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• **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 pre-covid semesters, I gave 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.

However, I quickly realized that the same pattern of evaluations would not work as well in an online environment. As stated by one student: “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.” What would be a better choice? While not a substitute for social support, giving more frequent quizzes and exams has seemed to help by both providing an ongoing schedule of tasks, as well as making the tasks at hand seem more manageable. So I started giving five application-based exams, so basically one every three weeks of class, coupled with 15 “are-you-keeping-up-with-the-basic-information” type quizzes consisting of 10 straightforward true-false (or perhaps multiple choice) questions.

This semester, as we continue our journey back into an in-person format, I have decided to stick with the basic online testing format of five exams and 15 quizzes. Although, as mentioned earlier, all five exams will be given in-person during class time. The quizzes, however, will remain online (via Canvas) and made available during windows of time outside of scheduled class time. You will need to figure out a time within those windows that works for your schedule. All quizzes are considered open-note, but once you start a quiz you will have a limited time to complete it (somewhere between 15 and 20 minutes). At the end of the semester, I plan to reevaluate this format, and will be interested in your feedback.

CODE OF CONDUCT:

As I am sure that you are aware, giving online, time flexible, open note quizzes increases the opportunity for certain forms of “cheating”. So, let me explain my perspective.

It has always been my personal/professional policy to trust others until I am given reason not to. That policy is not based on the belief that no one will ever violate that trust in unnoticed ways, but on the belief that starting each interaction with an expectation of mutual respect is much more productive. The focus then can be on providing meaningful opportunities instead of subverting/disrupting those opportunities because someone just might “cheat” in some way and not get caught. Furthermore, I do not equate not getting caught with getting away with it. The brain is set up such that engaging in meaningful educational experiences increases one’s abilities, and the more capable one becomes, the more one can potentially accomplish, which by definition creates more future opportunities. Embracing the challenge of education is to invest in oneself! So the bottom line is that, other than being available to address questions that arise, I am not going to attempt any type of online proctoring of quizzes. Until I have reason to suspect otherwise, I will simply trust each of you to act with integrity.

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.) Over the many years that I have taught this class, the distribution has been relatively consistent. But, given that I am always exploring how to best structure this course, hence always trying new things, and each set of students is a unique group with a unique collective history, I always feel uncomfortable creating an absolutely fixed grading scale from the outset. So what is presented below is the starting scale. No aspect of the scale will be raised higher, but if seemingly warranted, I may make some downward adjustments.

A	92% or above	C	56 to 63.5%
A-	88 to 91.5%	C-	50 to 55.5%
B+	84 to 87.5%	D	45 to 49.5%
B	78 to 83.5%	E	below 44.5%
B-	72 to 77.5%		
C+	64 to 71.5%		

Next, I explain the various ways that your class percentage will be calculated:

First, your exam percentage will be calculated in two ways: (1) the percentage of all five exams, (2) the percentage of just the final four exams, and then I will use whatever is higher. In effect, your first exam score will be dropped if it lowers your overall exam percentage. The reason I do this is that the first exam basically covers background information for the rest of the course, so if someone is able to use feedback from the first exam to improve thereafter, then great! The exam portion of your grade will be based solely on your performance covering core course material. On the other hand, please note that this is not a drop your lowest exam policy! Given that they cover core course material, your performance on the last four exams will be used in calculating the exam portion of your final grade. And that policy will not change!

Second, in contrast to exams, I am going to drop your the lowest three quiz scores, when calculating your quiz percentage. In other words, your quiz percent average will be based on your highest 12 quiz scores.

Third, I will calculate your final class percentage in two ways: (1) only using your exam percentage, and (2) combining your performance on exams (67% of grade) and quizzes (33% of grade). In the end, I will use whatever scale yields the highest results. Another way of seeing this is that taking any 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.

Forth, 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.

Finally, let me mention that 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.

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!

All quizzes will be given on-line. To avoid any overlap between TA sessions or class times, they will open on either a Sunday or a Tuesday after evening TA sessions conclude (likely around 9pm), and then close at 2:50pm the next day (15 minutes before class begins). Given that I will go over quizzes at the beginning of each class, as a general policy, any quiz not completed during that time period CANNOT be made up. But because only the highest twelve quiz scores are used in calculating the the quiz portion of your grade, unless you miss more than three, missed quiz scores will simply be dropped.

WITHDRAWALS AND INCOMPLETES:

Friday, September 1 and **Friday, October 20** are two days to be aware of. Up to **Friday, September 1** you can drop this course. After **September 1** and up to **Friday, October 20**, 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 **October 20** 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 (PRE-COVID) 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.