

Random Thoughts . . .

TIPS ON TEST-TAKING*

RICHARD M. FELDER

North Carolina State University

JAMES E. STICE

University of Texas

Dear students,

In our combined 88 years of teaching, we noticed that many of our students made some serious mistakes when preparing for and taking our exams. They knew the material, solved the homework problems, and studied hard for the test, but their grades didn't reflect their knowledge or effort. We eventually put together a handout with some tips on exams and passed it out in our classes a week or two before the first midterm. We heard back from some students that the ideas helped them, and later heard from others who had ignored us and bombed the first test but then took the handout seriously and did much better on the second one. The tips follow—check them out and use what seems relevant.

Richard M. Felder is Hoechst Celanese Professor Emeritus of Chemical Engineering at North Carolina State University. He is co-author of *Elementary Principles of Chemical Processes* (Wiley, 2005) and numerous articles on chemical process engineering and engineering and science education, and regularly presents workshops on effective college teaching at campuses and conferences around the world. Many of his publications can be seen at <www.ncsu.edu/effective_teaching>.



James E. Stice is Bob R. Dorsey Professor of Engineering (Emeritus) at the University of Texas-Austin. He was the founding director of the UT Center for Teaching Effectiveness. He has been chairman of the Chemical Engineering Division, vice president, and active in the Educational and Research Division of ASEE. He has received 12 awards for engineering teaching at UT, and the Chester F. Carlson, Donald E. Marlowe, Lifetime Achievement in ChE Pedagogical Scholarship, ERM Distinguished Service, and Benjamin Garver Lamme Awards from ASEE. He is a Fellow and a Life Member of ASEE, a Distinguished Alumnus of the University of Arkansas, and of the Illinois Institute of Technology.

Preparing for the test

1. **Avoid cramming.** Grinding away on problems for hours, especially the night before the exam, is a recipe for failure. Your brain needs time to process information, and a lot of the most important processing occurs subconsciously during sleep and breaks from studying. If you flood your brain with non-stop information, not much of it is likely to be stored in long-term memory and most of what is stored is unlikely to be retrievable on the test. Instead:
2. **Start studying early and take breaks.** Starting a few days before the exam, set a timer for about 30 minutes and focus exclusively on studying during that interval—no phoning, texting, surfing, email, computer games, TV, or anything else but studying. If possible, find a place to work where those distractions can't tempt you. When the time is up, stop, even if you're in the middle of a problem, and reward yourself with a break. Get a snack, take a walk, work on another course, or just relax. When you're ready, do another half hour. You'll be amazed at how often something that baffled you before seems clear now.
3. **Don't waste time on useless activities.** Several common test preparation strategies have been shown to have little or no effect on grades. Highlighting sentences in texts and passively reading worked-out problem solutions top the list. Highlighting is quick, and if it gives you the illusion that you're accomplishing something useful, go for it. Reading old solutions chews up time, though, and there are much better ways to spend the limited amount you have. So how *should* you prepare?
4. **Practice solving as many different problems as you can.** Work through old homework problems, unassigned problems in the course text, and old exams. **Set up the solutions, but don't bother doing all the algebra and**

* Some of the ideas to be presented were inspired by material in Oakley, B. (in press), *A Mind for Numbers*. New York: Tarcher-Penguin.

number-crunching. Those things take a lot of time and you don't learn much from them.

5. ***If you have old exams, don't limit your studying to them.*** The problems on the test coming up will almost certainly be different.
6. ***If you've been told to draw a diagram for a type of problem, do it again and again.*** While it's tempting to skip the preliminaries and just start writing equations, taking a few minutes to sketch that free-body diagram or flow chart or any other recommended visualization tool can turn killer problems into trivial ones.
7. ***After you've worked out a really hard problem, try outlining the solution without looking back.*** Once you can do that, you own that problem and others like it.
8. ***Study in small groups.*** Make sure your study group contains only students who are serious about studying, ideally including some at your ability level or better. Leave the beer in the refrigerator until you're done studying.
9. ***Make up a one-page summary sheet of the key terms, ideas, formulas, etc., that you might need to know on the test.*** If the test is closed-book, know what's on the sheet. If it's open-book, bring the sheet with you and add page numbers of key figures and tables.
10. ***Try to get a reasonable amount of sleep the night before the exam.*** (See Item 1.) If that's not possible, at least try to get a brief nap: it might be enough to keep your brain functional long enough to get through the test.
11. ***If the exam is first thing in the morning, set up backups for your alarm clock and transportation.*** Set a second alarm, or arrange for a wake-up call. If you live off campus, leave early so you have time to call someone to pick you up if your car won't start.
12. ***Bring everything you need to the exam.*** Make a list the day before and go through it before you leave in the morning. Include your text if the exam is open-book, several pencils with erasers, handouts, and a *fully charged* calculator, smartphone, or portable computer if you're allowed to use one on the test.

Taking the Test

13. ***Read over the whole test before writing anything.*** Choose the problem or question that seems easiest to you and do it first, then choose the next easiest, and so on. You'll get the easiest points quickly and gain confidence as you move into the harder stuff.
14. ***Read each problem/question carefully and make sure***

you deliver everything asked for. Few things are more frustrating than wasting time on an impossible problem because you ignored a small detail in the problem statement, or losing major points because you forgot to do an easy calculation.

15. ***Show your work.*** Give enough detail so that the grader can easily see what you're doing. Even if you can do the problem in your head and just write the answer down, don't. If you're wrong, you get a zero; if you're right, you could be suspected of cheating.
16. ***Watch the significant figures.*** Some instructors don't appreciate answers like 23.694028, even though it's exactly what the calculator says.
17. ***Think partial credit.*** Try to put something down for every part of every problem. If you don't have time to completely solve a problem, outline what you'd do if you had more time.
18. ***STAY IN MOTION, and budget your time.*** Work on a problem until you get stuck. Think about it for a minute or two, and if nothing comes to you then drop it and go on to another problem. Don't spend 30 minutes sweating out an additional five points on a problem and run out of time, leaving a 40-point problem untouched. You may have time to return to the first one and you're much more likely to see how to do it then.
19. ***If you don't understand a question, ask the instructor/proctor for help.*** You might get some, and it never hurts to try.
20. ***Don't panic.*** If you feel yourself blanking out or hyperventilating, put down your pencil, close your eyes, take a few deep breaths, and consciously relax clenched muscles (jaw, neck, stomach) for 10–20 seconds. When you're calmer, go back to work.
21. ***If you have time at the end, check your solutions.*** Did you answer every part of every question? Do your answers seem reasonable? Can you check them?
22. ***Hand in your paper when time is called.*** Nothing irritates an instructor/proctor more than having to wrestle you to the floor to get your paper.

Good luck.

RF/JS

P.S. What if you do those things and still do poorly on the test? Try filling out the questionnaire at <www.ncsu.edu/felder-public/Columns/memo.pdf>. If you check more than one or two "no" answers, you may get some insights into what you did wrong this time and avoid doing it next time. □

All of the *Random Thoughts* columns are now available on the World Wide Web at
http://www.ncsu.edu/effective_teaching and at www.che.ufl.edu/CEE.