

Mind over Matter

Tips for Conquering Standardized Exams

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13

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Whether you're preparing for graduate or professional school or taking the ACS standardized subject tests as finals for your courses, chances are that multiple-choice exams loom in your future. Many times students convince themselves that, while they are generally good test takers, they are "horrible at multiple-choice exams." Not true!

If you've had difficulty taking multiple-choice tests, often it may be simple fear or anxiety about the testing format itself that is getting in your way. If you can answer a question on a written exam, there is no reason you can't answer the same question in multiple-choice format... honestly! What may be holding you back from doing your best might be simply the lack of a viable strategy for using multiple choices to your advantage (after all, the correct

answer is there!) and feeling overwhelmed by the test format.

In this article I've included some practical, proven tips on how to prepare for subject-specific multiple-choice exams. I recommend that you also read "How to Ace Your Chemistry Exams," an article that appeared in the November/December 2011 *inChemistry* (pages 8–10). To access the article, go to www.acs.org/inChemistry and click the "Archives" link. That article provides a wealth of information for preparing for all tests, regardless of format.

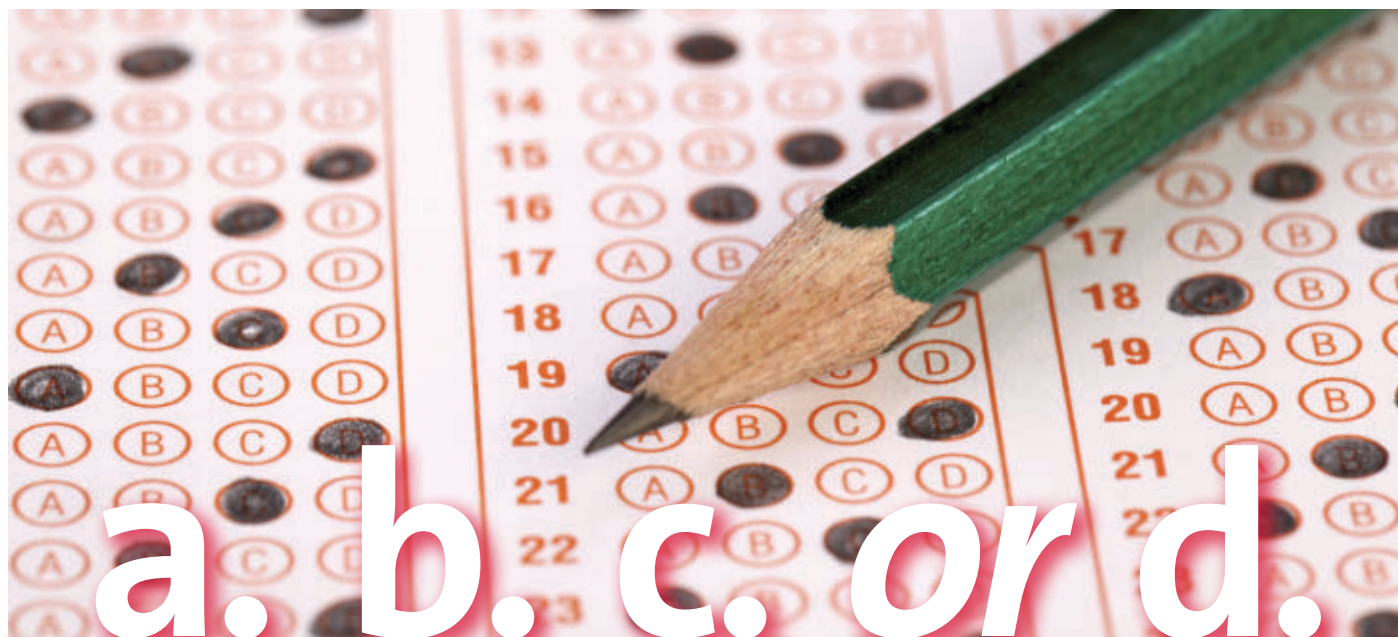
Before the test

Start early with your review book. Each spring I give my students the standardized ACS Organic Chemistry exam for their final exam, and I always make it a point to alert students about this months in advance, at the start of the fall semester.

Typically, when I see students carrying around the ACS student study guide or a Medical College Admission Test (MCAT) book throughout the school year, I know that those students are more likely than others to do very well in my course. The review guide (like the MCAT review book) isn't intended for studying just for the week before the exam; it can and should be used as a supplement to your class textbook on a regular basis. When you cover a subject in class, you can refer to your review book to see how it is presented (and evaluated) for your standardized

exam. Not only will you be preparing for your future multiple-choice exam, you will also be reinforcing concepts that will help you in your course.

Practice creating your own multiple-choice questions. Multiple-choice questions don't simply appear from thin air; people write them. So *you* can write them, too. Spending some time making up multiple-choice questions will demystify them (see below for an example of how to create a multiple-choice question). Also, take some time to think about common mistakes



Breaking down a multiple-choice question

Looking for an effective study technique? Try developing some multiple-choice questions. One method is to rearrange a short-answer question to make it into a multiple-choice question. Many multiple-choice questions follow the same format: one correct answer, one incorrect answer with an obvious mistake, and two incorrect answers with common but perhaps less obvious mistakes.

Thinking through common mistakes helps stop you from making those mistakes yourself! For example, the following short-answer question could easily be worked into a multiple-choice question:

A STUDENT DESIGNS A REACTION BETWEEN 1-CHLOROBUTANE AND SODIUM METHOXIDE IN DMSO. WHAT SHOULD SHE EXPECT THE OBSERVED RATE EQUATION TO BE?

This question is testing your knowledge of reactions between primary alkyl halides (like 1-chlorobutane) and strong nucleophiles (like the methoxide ion) in polar aprotic solvents (like DMSO), which favor the S_N2 mechanism. The rate of an S_N2 mechanism is dependent on both the nucleophile and the substrate, so $\text{Rate} = k[1\text{-chlorobutane}][\text{sodium methoxide}]$ is the correct answer.

What are some common mistakes students make when answering this question? Some students might wrongly imagine that the reaction was S_N1 , where the rate would be dependent only on the substrate, with $\text{Rate} = k[1\text{-chlorobutane}]$. Others who are confused about substitution rate equations might mistakenly believe that the rate was dependent only on the nucleophile, with $\text{Rate} = k[\text{sodium methoxide}]$. A third misconception (and the one with the most obvious mistake) would be to imagine that the solvent had a role in the rate equation, something like $\text{Rate} = k[1\text{-chlorobutane}][\text{DMSO}]$.

By spotting the false leads and assumptions in answers (a), (b), and (d), you can end up deducing that (c) is the correct answer.

- a. $\text{Rate} = k[\text{sodium methoxide}]$
- b. $\text{Rate} = k[1\text{-chlorobutane}]$
- c. $\text{Rate} = k[1\text{-chlorobutane}][\text{sodium methoxide}]$
- d. $\text{Rate} = k[1\text{-chlorobutane}][\text{DMSO}]$

Setting up questions like this one for friends, and having them do the same for you, not only allows you to prepare for those standardized exams, but also helps you succeed in the course. **IC**

or misconceptions surrounding a concept; this is what instructors do when they create incorrect choices for multiple-choice exams. The exercise will help you to understand the material better and avoid common pitfalls.

Take a practice test mimicking test conditions. Most standardized exams have review guides with practice exams. It helps not only to take those exams, but to take them in conditions similar to the conditions you will see on test day. Give yourself a quiet place without distractions, and also without the comforts of your dorm room (snacks, music, comfy chair). A library cubicle, small unoccupied computer lab, or a dedicated testing/study room would be perfect for taking most practice exams. If your exam will be administered on a computer, find out if your career services office or chemistry department has practice tests online so that you can practice on a computer.

Sometimes timing is a huge issue; either students rush through the exam, thinking that they will run out of time, or suddenly they discover that there are only 10 minutes left and still 20 questions to go! If you practice often enough, you won't be caught unawares by the clock or conditions on your exam day.

Set the stage right for the big day. A good night's sleep will do more for your performance on exam day than cramming into the wee hours to learn one last equation or concept. Put down the books by dinner, relax, and get to bed early. The chance that the one last concept you stayed up all night to master will actually be on the exam is small, but it is 100% certain that you will need to be alert and at the top of your game to do your best. Nerves can get in the way with multiple-choice exams differently than with other types of exams. When the answers are already provided, it is easy to second-guess yourself, get confused with all the choices, or even make mistakes in reading the question. Lack of sleep will only make it harder to stay focused. If you need to travel to your exam, be sure to leave yourself lots of time to get to the testing site so that you can relax in the building well before you have to take the test.

During the test

Read the question carefully. Don't be so worried about getting to the next question that you miss something easy because you misread a sentence. Favorite question phrasings include "all of the following *except*..." and "which of the following *does*" or "does *not*." Small details (including use of the words "except," "does," and "does not") make a big difference in the meaning of a test question!

If possible and reasonable, determine the answer to a question before you look at the provided answer choices. Typically a test will include some questions where the answer is fairly obvious and you simply need to look at the answer choices to solve the question. These sorts of questions tend to contain the phrases "which of the following..." or "all of the following *except*..." Some problems expect you to estimate the magnitude of the answer, rather than do all the arithmetic, and then pick the answer with the correct order of magnitude. But if the

question is straightforward and you are comfortable working through the problem, then work through it. You are less likely to be caught up in an easy mistake if you are able to approach the choices having an answer confidently in mind.

Look at the answers carefully. This is the most common problem I encounter when I help students prepare for exams. Be sure to read *all* the answers — even when you are sure that the first answer is correct. If you sometimes tend to skim through the answers, then force yourself to read all the answers carefully. So many students get caught in the trap of missing "choice D: both A *and* C" or another such combination. Consider all the answers before you commit to the one you think is correct. Look carefully at all the choices to see if any answers change your understanding of the problem before you choose an answer to the question. Sometimes you can spot a nuance and avoid choosing an obviously incorrect choice when you examine all of the other possible answers.

Think logically about the provided answer choices if you don't know how to answer the question. If you don't have any clear idea how to solve a problem, look at the answers and see if they spark any ideas. Do most of the answers seem to be reduction products? Then perhaps that reagent you don't remember is a reducing agent. Are the units of most of the answers in grams? Then perhaps the problem is asking you to solve for a mass. Drawing conclusions from the types of answers is a great way to jog your memory as to what the question is really about. Sometimes you can look at answers and easily eliminate one or two of the answers; for example, you know you are solving for moles and one of the answers has kilograms as a unit. If you can narrow the choices down to two possibilities, it is worth taking a guess and choosing an answer, even if you aren't completely certain. Another technique is to work backwards from the answer and see if you can make any of them match the question. If you can connect one of the answers to the question, and solve the problem that way, it doesn't matter if you got there back-to-front!

When in doubt, trust yourself. Some students are often so afraid of trusting themselves to find the correct answer that they are overwhelmed by all of the choices. Trust yourself! If you could produce the answer on a blank page, you can recognize it when it is hidden. If you believe you have the correct answer, don't overthink it, just answer the question and move on. If you are caught between two answers, and you have a hunch that one is correct, don't second-guess yourself — instead, go with your gut. Keep remembering that this is just another test; if you know the material, you can show that you know the material, no matter what the format of the exam. Good luck! **IC**



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