Peterson's

Master AP Chemistry

2nd Edition

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Second Edition

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Check out our Web site at www.petersons.com/publishing to see if there is any new information regarding the tests and any revisions or corrections to the content of this book. We've made sure the information in this book is accurate and up-to-date; however, the test format or content may have changed since the time of publication.

OTHER RECOMMENDED TITLES

Peterson's Master AP Calculus
Peterson's Master AP U.S. Government & Politics
Peterson's Master AP English Language & Composition
Peterson's Master AP English Literature & Composition
Peterson's Master AP U.S. History

Contents

Before You Begin

HOW THIS BOOK IS ORGANIZED

Whether you have five months, nine weeks, or just four short weeks to prepare for the test, *Peterson's Master AP Chemistry* will help you develop a study plan that caters to your individual needs and timetables. These step-by-step plans are easy to follow and are remarkably effective.

- **Top 10 Strategies to Raise Your Score** gives you tried and true test-taking strategies.
- **Part I** includes the basic information about the AP Chemistry Test that you need to know.
- **Part II** provides a diagnostic test to determine your strengths and weaknesses. Use the diagnostic test as a tool to improve your objective test-taking skills.
- **Part III** provides reviews and strategies for answering the different kinds of multiple-choice and free-response questions you will encounter on the test. You will have numerous opportunities to practice what you are learning in the Try It Out! quizzes and exercises that follow the reviews. It is a good idea to read the answer explanations to all of the questions, because you may find ideas or tips that will help you better analyze the answers in the practice tests.
- **Part IV** includes two additional practice tests. Remember to apply the test-taking system carefully, work the system to get more correct responses, be careful of your time, and strive to answer more questions in the time period.
- The **Appendix** provides you with the new Peterson's College-by-College Guide to AP Credit and Placement (for more than 400 selective colleges and universities).

SPECIAL STUDY FEATURES

Peterson's Master AP Chemistry was designed to be as user-friendly as it is complete. It includes several features to make your preparation easier.

Overview

Each chapter begins with a bulleted overview listing the topics that will be covered in the chapter. You know immediately where to look for a topic that you need to work on.

Summing It Up

Each strategy chapter ends with a point-by-point summary that captures the most important points. The summaries are a convenient way to review the content of these strategy chapters.

Bonus Information

In addition, be sure too look in the page margins of your book for the following test-prep tools:

NOTE

Notes highlight critical information about the test.

TIP

Tips draw your attention to valuable concepts, advice, and shortcuts for tackling the test. By reading the tips, you will learn how to approach different question types, pace yourself, and remember what was discussed previously in the book.

ALERT!

Whenever you need to be careful of a common pitfall, you'll find an *Alert!* This information reveals and eliminates the misperceptions and wrong turns many people take on the test. By taking full advantage of all features presented in *Peterson's Master AP Chemistry,* you will become much more comfortable with the test and considerably more confident about getting a high score.

APPENDIX

Peterson's College-by-College Guide to AP Credit and Placement gives you the equivalent classes, scores, and credit awarded at more than 400 colleges and universities. Use this guide to find your possible placement status, credit, and/or exemption based on your AP Chemistry score.

YOU'RE WELL ON YOUR WAY TO SUCCESS

Remember that knowledge is power. You will be studying the most comprehensive guide available, and you will become extremely knowledgeable about the test. We look forward to helping you raise your score.

www.petersons.com

GIVE US YOUR FEEDBACK

Peterson's, a Nelnet company, publishes a full line of resources to help guide you through the college admission process. Peterson's publications can be found at your local bookstore, library, and high school guidance office, and you can access us online at www.petersons.com.

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Your feedback will help us to provide personalized solutions for your educational advancement.

TOP 10 STRATEGIES TO RAISE YOUR SCORE

When it comes to taking an AP test, some test-taking skills will do you more good than others. Here's our pick for the top 10 strategies to raise your score:

1. **Pace yourself.** Questions usually go from easiest to most difficult. Work as quickly as you can through the beginning of the test. Don't get lulled into a false sense of security because you appear to be maintaining a good pace in the first part.
2. **Educated guessing will boost your score.** Although random guessing won't help you, anything better than random guessing will. You should be able to make better-than-random guesses by using common sense and the process of elimination techniques that are developed throughout this book.
3. **The easy answer isn't always the best answer.** Quite frequently, test makers will put an attractive, but incorrect, answer as an (A) or (B) choice. Reading all of the choices decreases your chance of being misled, particularly in questions where no calculations are involved.
4. **Use common sense.** On multiple-choice questions, it might be readily apparent that you've made an error (e.g., none of the choices match your answer). However, on the free response, there is no immediate feedback about the accuracy of your answer. It is important to inspect your work to make sure it makes sense.
5. **Put down your calculator.** On the portions of the test where calculators are prohibited, you should expect to deal with numbers that are fairly easy to work with. However, you want to sharpen your skills for solving problems without a calculator.
6. **Become familiar with a few properties of logarithms.** There are several formulas that require the use of logarithms. Because logarithms are easy to work with on a calculator, you may never have learned much about them. Becoming familiar with a few properties of logarithms can help you work more quickly on some problems, especially pH problems.
7. **Make sure you fill in the bubble sheet neatly.** Otherwise, the machine that scores your answers won't give you credit.
8. **Show all of your work on the free-response questions.** If you only show your answer, and it happens to be incorrect, the grader has no choice but to give you no credit for the entire question. Writing down all of your steps makes sense.
9. **Know your stuff.** You may not know every bit of information on the test, but it is important that you remember the information you have learned.
10. **Be neat on the free-response questions.** Let the grader focus on content, rather than the form. The answers are not lengthy, so do your best to be neat and organized.

PART I

AP CHEMISTRY BASICS

CHAPTER 1 All About the AP Chemistry Test

chapter 1

All About the AP Chemistry Test

OVERVIEW

- Getting started
- Preparing for the AP Chemistry Test
- Making a study plan
- What the test covers
- Getting to know the format of the test
- How the AP Chemistry Test is scored
- Review of the AP question types
- The answer sheets
- Summing it up

GETTING STARTED

There is no question that the AP Chemistry Test is one of the most rigorous tests offered by the College Board. Chances are, however, that if you are planning to take the AP Chemistry Test, you are the type of student who is ready to take on anything this test can dish out. You didn't take AP Chem by accident—you wanted to take it, and that's because you are the type of student who can handle challenges. So, although the test is difficult, don't be intimidated by it. You can beat this test!

PREPARING FOR THE AP CHEMISTRY TEST

Your first step is to understand that this test is not something to be taken lightly. Top athletes spend a great deal of time preparing their bodies for big competitions, and you, too, must prepare your mind for this test. But most athletes don't train by themselves. They work out with an experienced coach who knows the keys to being successful. In preparation for the AP challenge, you will need a coach to help you learn the best strategies for the test. **Your teacher should be your first coach.** Due to the time constraints that teachers face and the extensive amount of material covered in this course, you

will also need an assistant coach to help you prepare. This book can be that assistant coach, but it is not designed to replace your teacher. He or she knows the course, the material, and you, but unless your teacher can move in with you while you are preparing for the test, he or she can't provide you with all of the tools you will need to succeed. There aren't enough hours in the school day to teach you everything you need to know for the test. This book can be your personal tutor. The material between its covers will help to familiarize you with all of the material covered on the test, the structure of the test, and strategies to prepare for and to take the test and it can provide you with instant feedback about your performance. This book is also designed with the understanding that your time is valuable! You most likely have a very busy schedule before and after school, and the last thing you need is to add another time-consuming activity. Some of the information that you may have learned or that is in your textbook may go beyond the level of the AP test. On other subjects, you may have learned less information than you need. This book attempts to get right to the point and to only review the material that you will need to know for the test.

MAKING A STUDY PLAN

The fact that you bought this book is a step in the right direction for your success on the AP Chemistry Test. And there are some strategies that will help you get the most out of it. The following are two key questions you need to answer before you proceed:

1. How much time do I have before the AP test?
2. How much time can I realistically devote to test preparation?

Your answers to these questions will help you to set a pace for your review. If you have a long time before the test (two or three months), you can set a fairly relaxed pace. If you have a short time (one month or less), your pace will be more rigorous. Either way, the book is designed to be flexible and to accommodate a variety of situations. What follows is a brief description of the remainder of the book and how you can use it under different circumstances.

Read this section, and then go on to Chapter 3. These chapters contain vital information about the AP test that will help you to develop sound test-taking strategies. Once finished, take the diagnostic test. Before you take it, however, you need to understand that the diagnostic test is **not** a practice AP test! This book has two full-length practice AP tests, but they do not appear until Part IV of the book. The diagnostic test is designed to resemble the approximate difficulty level of the AP test and to reflect the content on the test, but there are some significant differences in the structures of the two. The purpose of the test is to help you identify strengths and potential weaknesses, which you'll need to know to design your personal study plan. Once you finish the diagnostic test, use these suggested guidelines to complete your test preparations.

The Complete Course

If you have plenty of time before the test (two or three months), it is recommended that you complete the entire course. There are nineteen chapters, so if you divide these up over a two-month period, you would need to complete about two chapters a week. If you have a three-month period, this drops down to about one chapter every five or six days. You will

receive the maximum benefit if you can complete the entire book. Even if you are planning to complete the entire book, it is recommended that you pick the most difficult areas first, especially those that you may not have covered much (or at all) in class. This way, if something happens and you don't have as much time as you thought, you've at least gone through the sections that will benefit you the most.

The Accelerated Course

If you are running out of time, you'll need to design an ambush approach to your studies. Don't attempt to complete the entire book. From the diagnostic test, select your weakest areas and plan to go through those first. Make a list of the topics you feel you can reasonably work through before the test. Be very careful during this process. Do not skip sections you know very little about, figuring, "Oh, that probably won't be on the test." If it is on the content outline, it will be on the test! And, if you are especially unfortunate, the section you skip could end up as one of the mandatory essay questions. Even if you don't have time for all of the practice problems in a section, get through what you can. If you know certain topics very well, skip them. It's not ideal, but if you are reading this section (for the accelerated course) it is probably because you don't have time to do everything. Just remember, though, that every chapter you can work through is a bonus for you. Rather than be discouraged about not having enough time to finish everything, be encouraged about the sections you will finish. These are areas you wouldn't have known or would have done poorly on without your extra effort. Be positive!

WHAT THE TEST COVERS

Each year, the College Board provides a content outline for the AP Chemistry course as well as a breakdown of the approximate percentage of the AP test that will deal with certain topics. What follows is an outline of the content of the most recent test.

Structure of Matter (20 percent)

- Atomic theory and atomic structure
    - Evidence for the atomic theory
    - Atomic masses; determination by chemical and physical means
    - Atomic number and mass number; isotopes
    - Electron energy levels: atomic spectra, quantum numbers, atomic orbitals
    - Periodic relationships, such as atomic radii, ionization energies, electron affinities, and oxidation states
- Chemical bonding
    - Binding forces
        - Types: ionic, covalent, metallic, hydrogen bonding, van der Waals theory (including London dispersion forces)
        - Relationships to states, structure, and properties of matter
        - Polarity of bonds, electronegativities

- Molecular models
  - Lewis structures
  - Valence bond: hybridization of orbitals, resonance, and sigma and pi bonds
  - VSEPR
- Geometry of molecules and ions, structural isomerism of simple organic molecules and coordination complexes; dipole moments of molecules; relation of properties to structure
- Nuclear chemistry: nuclear equations, half-lives, and radioactivity; chemical applications

States of Matter (20 percent)

- Gases
  - Laws of ideal gases
    - Equation of state for an ideal gas
    - Partial pressures
  - Kinetic-molecular theory
    - Interpretation of ideal gas laws on the basis of this theory
    - Avogadro's hypothesis and the mole concept
    - Dependence of kinetic energy of molecules on temperature
    - Deviations from ideal gas laws
- Liquids and solids
  - Liquids and solids from the kinetic-molecular viewpoint
  - Phase diagrams of one-component systems
  - Changes of state, including critical points and triple points
  - Structure of solids; lattice energies
- Solutions
  - Types of solutions and factors affecting solubility
  - Methods of expressing concentration (The use of normalities is not tested.)
  - Raoult's law and colligative properties (nonvolatile solutes); osmosis
  - Nonideal behavior (qualitative aspects)

Reactions (35–40 percent)

- Reaction types
  - Acid-base reactions; concepts of Arrhenius, Brønsted-Lowry, and Lewis; coordination complexes; amphoterism
  - Precipitation reactions