
Introduction

EXAM FORMAT

The Principles and Practice of Engineering examination (PE exam) in chemical engineering is an 8-hour exam divided into a morning and an afternoon session.

The morning and afternoon sessions each include 40 problems from the six chemical engineering subdisciplines (mass/energy balances and thermodynamics, fluids, heat transfer, mass transfer, kinetics, and plant design and operation). All problems are multiple choice. They include a problem statement with all required defining information, followed by four logical choices. Only one of the four options is correct. Nearly every problem is completely independent of all others, so an incorrect choice on one problem typically will not carry over to subsequent problems.

Topics and the approximate distribution of problems on the chemical exam are as follows.

- Mass/Energy Balances and Thermodynamics: approximately 24% of exam problems
- Fluids: approximately 17% of exam problems
- Heat Transfer: approximately 16% of exam problems
- Mass Transfer: approximately 13% of exam problems
- Kinetics: approximately 11% of exam problems
- Plant Design and Operation: approximately 19% of exam problems

Passing the test requires a score of at least 70%. This implies that you must correctly answer 56 of the 80 problems, unless the examination committee decides that a question is defective and discards it. In other words, if you take more than approximately 8½ minutes to solve each problem, it is possible that you will NOT pass, *even if all of your answers are correct*. This makes practice at working problems vital to passing the test.

For further information and tips on how to prepare for the chemical environmental engineering PE exam, consult the *Chemical Engineering Reference Manual* or Professional Publications' website, www.ppi2pass.com.

THIS BOOK'S ORGANIZATION

Six-Minute Solutions for Chemical PE Exam Problems is organized into six sections, one for each subject on the exam.

Most of the problems are quantitative, requiring calculations to arrive at a correct solution. A few are non-quantitative. Some problems will require a little more than 6 minutes to answer and others a little less. In order to answer all the questions, you should aim to complete 80 problems in 480 minutes (8 hours), or on average, spend 6 minutes per problem.

HOW TO USE THIS BOOK

In *Six-Minute Solutions for Chemical PE Exam Problems*, each problem statement, with its supporting information and answer choices, is presented in the same format as the problems encountered on the PE exam. The solutions are presented in a step-by-step sequence to help you follow the logical development of the correct solution and to provide examples of how you may want to approach your solutions as you take the PE exam.

Each problem includes a hint to provide direction in solving the problem. In addition to the correct solution, you will find an explanation of the faulty solutions leading to the three incorrect answer choices. The incorrect solutions are intended to represent common mistakes made when solving each type of problem. These may be simple mathematical errors, such as failing to square a term in an equation, or more serious errors, such as using the wrong equation.

To optimize your study time and obtain the maximum benefit from the practice problems, consider the following suggestions.

1. Complete an overall review of the problems and identify the subjects that you are least familiar with. Work a few of these problems to assess your general understanding of the subjects and to identify your strengths and weaknesses.
2. Locate and organize relevant resource materials. (See the References section of this book for guidance.) As you work problems, some of these resources will emerge as more useful to you than others. You will want to have these on hand when taking the PE exam.

3. Work the problems in one subject area at a time, starting with the subject areas that you have the most difficulty with.
4. When possible, work problems without utilizing the hint. Always attempt your own solution before looking at the solutions provided in the book. Use the solutions to check your work or to provide guidance in finding solutions to the more difficult problems. Use the incorrect solutions to help identify pitfalls and to develop strategies to avoid them.
5. Use each subject area's solutions as a guide to understanding general problem-solving approaches. Although problems identical to those presented in *Six-Minute Solutions for Chemical PE Exam Problems* will not be encountered on the PE exam, the approach to solving problems will be the same.

Solutions presented for each example problem may represent only one of several methods for obtaining a correct answer. Although most of these problems have unique solutions, alternative problem-solving methods may produce a different, but nonetheless appropriate, answer.

Reference books often format their equations with "unit-less factors." It is "understood" that the particular form of the equation is **ONLY** valid if the rest of the variables in the equation are expressed in the proper units. In this book you will find that the implied units for these unit-less factors are shown explicitly in order to emphasize the importance of proper unit cancellation.