Preface

The major focus of the Third Edition of *Techniques in Organic Chemistry* is the same as the focus of the earlier editions: the fundamental techniques that students encounter in the organic chemistry laboratory. However, we have also expanded our emphasis on the areas that students need to develop their skills in the critical interpretation of their experimental data and to successfully carry out guided-inquiry experiments.

Organic chemistry is an experimental science, and students learn its process in the laboratory. Our primary goal should be to teach students how to carry out well-designed experiments and draw reasonable conclusions from their results—a process at the heart of science. We should work to find opportunities that engage students in addressing questions whose answers come from their experiments, in an environment where they can succeed. These opportunities should be designed to catch students' interest, transporting them from passive spectators to active participants. A well-written and comprehensive textbook on the techniques of experimental organic chemistry is an important asset in reaching these goals.

Changes in the Third Edition

The Third Edition of *Techniques in Organic Chemistry* includes a number of new features. Entirely new sections have been added on planning a chemical reaction, computational chemistry, and ^{13}C nuclear magnetic resonance spectroscopy. A new chapter on UV-visible spectroscopy has been added. Many sections concerning basic techniques have been brought up to date and reorganized to better meet the practical needs of students as they encounter laboratory work.

A short essay introduces each of the five major parts of the Third Edition, on topics from the role of the laboratory to the spectroscopic revolution. Perhaps most important, the essay Intermolecular Forces in Organic Chemistry provides the basis for subsequent discussions on organic separation and purification techniques.

Many important features of earlier editions have been retained in the Third Edition. Subsections on sources of confusion again walk students through the pitfalls that could easily discourage them if they did not have this practical support. For easy reference, commonly used data on solvents and acids and bases, as well as quick references to frequently used techniques, are located inside the front cover. Data tables for IR and NMR spectroscopy appear inside the back cover and on the back foldout. We believe that these features will assist active learning as students encounter the need for this information during their laboratory work.

Who Should Use This Book?

The book is intended to serve as a laboratory textbook of experimental techniques for all students of organic chemistry. It can be used in conjunction with any lab experiments to provide the background and skills necessary for mastering the organic

chemistry laboratory. The book is written to provide effective support for guided-inquiry and design-based experiments and projects. It can also serve as a useful reference for laboratory practitioners and instructors.

Flexibility

Techniques in Organic Chemistry offers a great deal of flexibility. It can be used in any organic laboratory with any glassware. The basic techniques for using standard taper miniscale glassware as well as 14/10 standard taper microscale and Williamson microscale glassware are all covered. The miniscale glassware that is described is appropriate with virtually any 14/20 or 19/22 standard taper glassware kit.

Modern Instrumentation

Modern instrumental methods play a crucial role in supporting guided-inquiry experiments, which provide the active learning opportunities many instructors seek for their students. We feature instrumental methods that offer quick, reliable, quantitative data. NMR spectroscopy and gas chromatography are particularly important. Our emphasis is on how to acquire good data and how to read spectra efficiently and with real understanding. Chapters on ^{1}H and ^{13}C NMR, IR, and mass spectrometry stress the practical interpretation of spectra and how they can be used to answer questions posed in an experimental context. They describe how to deal with real laboratory samples and include case studies of analyzed spectra.

Organization

The book is divided into five parts:

- Part 1 has chapters on safety, green chemistry, and the lab notebook.
- Part 2 discusses glassware, measurements, heating methods, computational chemistry, and planning a chemical reaction.
- Part 3 introduces filtration, extraction, drying organic liquids, distillation, melting points, recrystallization, and a chapter on specialized techniques—sublimation, refractometry, measurement of optical activity, and inert atmosphere techniques.
- Part 4 presents the three chromatographic techniques widely used in the organic laboratory—thin-layer, liquid, and gas chromatography.
- Part 5 discusses IR, ^{1}H and ^{13}C NMR, MS, and UV-visible spectra in some detail.

Traditional organic qualitative analysis is available on our Web site: www.whfreeman.com/mohrig.

Modern Projects and Experiments in Organic Chemistry

The accompanying laboratory manual, *Modern Projects and Experiments in Organic Chemistry,* comes in two complete versions:

- *Modern Projects and Experiments in Organic Chemistry: Miniscale and Standard Taper Microscale* (ISBN 0-7167-9779-8)
- *Modern Projects and Experiments in Organic Chemistry: Miniscale and Williamson Microscale* (ISBN 0-7167-3921-6)

Modern Projects and Experiments is a combination of inquiry-based and traditional experiments, plus multiweek inquiry-based projects. It is designed to provide quality content, student accessibility, and instructor flexibility. This laboratory manual introduces students to the way the contemporary organic lab actually functions and allows them to experience the process of science.

Custom Publishing

All experiments and projects are available through LabPartner for Chemistry, Freeman Custom Publishing's newest offering. LabPartner provides instructors with a diverse database of experiments, selected from the extensive array published by W. H. Freeman and Hayden-McNeil Publishing. Instructors can use LabPartner to create their own customized lab manual by selecting specific experiments from *Modern Projects and Experiments*, adding experiments from other WHF or H-M titles, and incorporating their own original material so that the manual is organized to suit their course. Visit http://www.whfreeman.com/labpartner to learn more.

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We hope that teachers and students of organic chemistry find our approach to laboratory techniques effective, and we would be pleased to hear from those who use our book. Please write to us in care of the Chemistry Acquisitions Editor at W. H. Freeman and Company, 41 Madison Avenue, New York, NY 10010, or e-mail us at chemistry@whfreeman.com.