

Strange Bedfellows: Organic Synthesis and Essay-Writing

Interface

—Feature by
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C. W. Bowen and G. M. Bodner
"Problem-Solving Processes Used by
Graduate Students While Solving Tasks
in Organic Synthesis," *International
Journal of Science Education*,
vol. 13, no. 2, pp. 143-158, 1991.

Index Terms—Composition, problem solving, science pedagogy,
writing in the sciences, writing pedagogy.

Organic synthesis is the branch of chemistry that deals with the step-by-step conversion of relatively simple starting materials into larger, more complicated, target molecules. Synthesis problems given to undergraduates can often be solved in three or four steps; practicing chemists routinely tackle syntheses that contain 50 or more steps. There are two components to organic synthesis. The first involves the generation of a hypothetical sequence of reactions written on a sheet of paper, as shown, for example, in [Fig. 1]. The second is the process by which these reactions are carried out in the lab.

Among practicing chemists, these components are tightly linked; results obtained in the lab lead to modifications of the hypothetical sequence, which lead to changes in what is done in the lab, and so on. Interviews with undergraduates and graduate students involved in solving synthesis problems, however, suggest that there is little (if any) connection between the synthetic schemes the students propose on paper and

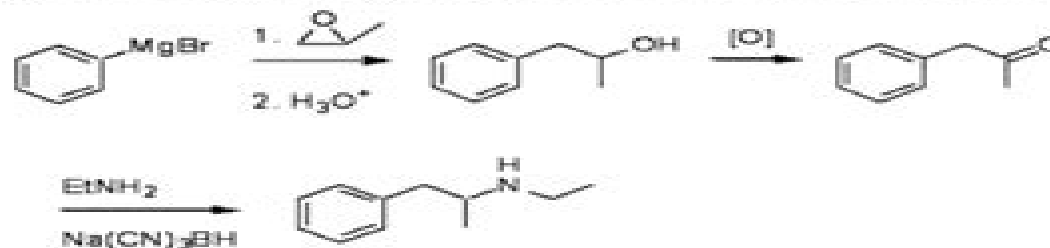
the procedures that would have to be carried out in the lab to effect these transformations.

This paper will focus on the process by which hypothetical synthetic schemes are generated on paper. As part of a long-term effort to understand how students and early-career practicing chemists learn organic chemistry, we have obtained results that have lead us to propose an analogy between the process by which essays are written and the process by which organic synthesis problems are solved.

In the process of writing an essay, the author uses knowledge of vocabulary, syntax, and discourse to creatively organize and then produce a paper. In the process of generating a synthesis, the chemist uses knowledge of structure, functional group reactivity, and reaction mechanisms to creatively organize and then produce a synthesis.

Both the writing of an essay and the design of an organic synthesis are goal-oriented, nonlinear, recursive activities that lead to a product that is greater than the

Fig. 1. Three-step synthesis of Apetinil, an appetite suppressant, from common starting materials.



Organic Synthesis Paper

John Andraos



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ORGANIC SYNTHESIS-A (English Edition) (Chemistry Book) Paper-I Dr. Rajesh Chandra Verma ,Dr. Vijay Deep Sharma ,2023-11-01 Buy ORGANIC SYNTHESIS A Paper I e Book in English Language for B Sc 5th Semester UP State Universities By Thakur publication **The Algebra of Organic Synthesis** John Andraos,2016-04-19 The Algebra of Organic Synthesis combines the aims philosophies and efforts involved in organic synthesis reaction optimization and green chemistry with techniques for determining quantitatively just how green synthesis plans are It provides the first complete quantitative description of synthesis strategy analysis in the context of green ch *Strategies and Tactics In Organic Synthesis* Thomas Lindberg,2012-12-02 Strategies and Tactics in Organic Synthesis presents the chronological development of ideas and experimentation in organic synthesis This book is organized into 13 chapters that explore the synthetic pathways of various organic compounds The first four chapters describe the variations in the synthesis of superphane gibberellic acid prostaglandin and alkaloids The following chapters cover the organic synthesis and biosynthesis of tylonolide endiandric acids A G dodecahedrane fomannosin and illudol A chapter focuses on the evolution of the total synthesis of jatrophone an architecturally interesting macrocyclic diterpene extracted from *Jatropha gossypifolia* Another chapter discusses the heuristic principle for the stereorationale design of alkaloid syntheses The remaining chapters discuss the approach to the total synthesis of steroids streptonigrin methynolide and Prelog Djerassi lactonic acid Organic chemists teachers and students will find this book of great value **Organic Synthesis** A. Bruylants,L. Ghosez,H.G. Viehe,2013-10-22 Organic Synthesis is a collection of papers dealing with synthetic tools the effect of pressure on the electronic states of organic solids and some novel approaches to alkylations Some papers explain the cyclopropanation of silyl enol ethers and the two phase reactions in the chemistry of carbanions and halocarbenes as useful tools in organic synthesis One paper investigates the biogenetic type synthesis of the bicyclic penicillin cephalosporin antibiotics from an acyclic tripeptide equivalent Another paper explains the advantages of the two phase system to generate trihalomethylanions and dihalocarbenes as it allows the investigator to carry out all the reactions typical for these species easily The system also readily applies to the reactions of some carbanions with aromatic nitrocompounds Thallium III nitrate TTN can be used as an oxidant in organic synthesis reactions that follow it use include the oxidations and oxidative rearrangements of olefins acetylenes ketones and compounds containing carbon nitrogen double bonds Another paper presents some examples that use singlet oxygen in synthetic organic chemistry This collection is useful for researchers technicians and scientists whose works involve organic chemistry analytical chemistry and other related fields of chemistry such as physical chemistry and inorganic chemistry *Strategies and Tactics in Organic Synthesis* Michael Harmata,2021-11-11 Strategies and Tactics in Organic Synthesis Volume 15 provides a forum for investigators to discuss their approach to the science and art of organic synthesis Rather than a simple presentation of data or a secondhand analysis this classic provides stories that vividly demonstrate the power of the human

endeavor known as organic synthesis and the creativity and tenacity of its practitioners Firsthand accounts of each project present the excitement of conception the frustration of failure and the joy experienced when either rational thought or good fortune gives rise to the successful completion of a project Readers will be educated challenged and inspired by these accounts which portray the idea that triumphs do not come without challenges This innovative approach also helps illustrate how challenges to further advance the science and art of organic synthesis can be overcome driving the field forward to meet the demands of society by discovering new reactions creating new designs and building molecules with atom and step economies that provide functional solutions to create a better world Provides insight and offers new perspective to problem solving Presents state of the art developments in organic synthesis Written by leading experts in the field Uses firsthand narrative accounts to vividly illustrate the challenges and joys involved in advancing the science of organic synthesis

Organic Synthesis Michael Smith, 2011-07-12 The first two chapters provide an introduction to functional groups these are followed by chapters reviewing basic organic transformations e g oxidation reduction The book then looks at carbon carbon bond formation reactions and ways to disconnect a bigger molecule into simpler building blocks Most chapters include an extensive list of questions to test the reader's understanding There is also a new chapter outlining full retrosynthetic analyses of complex molecules which highlights common problems made by scientists *Annual Reports in Organic Synthesis* 1999 Philip M. Weintraub, Daniel M. Ketcha, Christian Fossum, Allan Pinhas, 1999-08-23 One of the more difficult problems facing chemists today is that of keeping up with the literature Thus an organized annual review of synthetically useful information would prove beneficial to nearly all organic chemists both specialists and non specialists in synthesis Weintraub et al are very successful in creating such an original review Key Features Provides clearly illustrated structures of compounds in every feasible synthetic pathway Presents a general review of structure activity information for each synthetic compound Includes extensive reference information on additional publications available for each reaction discussed Yields a current awareness of the literature ideas for research and questions for cumulative exams Highlights papers dealing with asymmetric syntheses Remains the most comprehensive reasonably priced compilation of its type

Principles of Organic Synthesis Paper Norman, 1973-01-01 **Solid-Phase Organic Synthesis** Kevin Burgess, 2004-03-22 Solid Phase Organic Synthesis Edited by Kevin Burgess Texas A some report minor modifications enabling transformation of solution phase methods to a solid support while others report major innovations Solid Phase Organic Synthesis collects highlights and critiques some of the key developments in the field Leading practitioners explain different perspectives on diverse aspects of the area Specific topics covered include Syntheses of guanidines Palladium catalyzed C C bond forming reactions S_NAr reactions for the formation of heterocycles Sequence specific arylalkyne oligomers Resin supported capture agents and other reagents Synthesis on pins Monitoring of supported reactions using IR Solid phase syntheses of natural product derivatives Of related interest Combinatorial Chemistry and Molecular Diversity in

Drug Discovery Eric M Gordon and James F Kerwin 1998 0 471 15518 7 544 pp Combinatorial Chemistry Synthesis and Application Stephen R Wilson and Anthony W Czarnik 1997 0 471 12687 X 288 pp **Organic Synthesis, Reactions and Mechanisms** ,2022-07-18 No detailed description available for Organic Synthesis Reactions and Mechanisms Organic Synthesis Paul Wyatt, Stuart Warren, 2013-05-20 Organic Synthesis Strategy and Control is a sequel to Stuart Warren's bestseller Organic Synthesis The Disconnection Approach The Disconnection book concentrated on the planning behind the synthesis of compounds The two themes of this new book are strategy and control solving problems either by finding an alternative strategy or by controlling any established strategy to make it work The book is divided into five sections that deal with selectivity carbon carbon single bonds carbon carbon double bonds stereochemistry and functional group strategy Interpenetrating this structure the 36 chapters start with classic methods and progress to modern methods and modern strategic considerations Heterocyclic chemistry is treated throughout the book with full mechanistic explanations as part of organic chemistry rather than a separate mystery A comprehensive practical account of the key concepts involved in synthesising compounds Takes a mechanistic approach which explains reactions and gives guidelines on how reactions might behave in different situations Focuses on reactions that really work rather than those with limited application Extensive up to date references in each chapter Students and professional chemists familiar with Organic Synthesis The Disconnection Approach will enjoy the leap into a book designed for chemists at the coalface of organic synthesis **Organic Synthesis Via Examination of Selected Natural Products** David J. Hart, 2011 Complete with problems and solutions this book is written for advanced graduate and undergraduate students to expose them to a variety of strategies for the synthesis of organic compounds This is done largely within the context of natural products synthesis but includes some unnatural products synthesis Multiple approaches to each group of synthesis targets are presented and the approaches are compared with one another with an eye on similarities and differences General problems in organic synthesis for example strategies for the preparation of 6 membered rings and 5 membered rings the importance of oxidation state the problem of acyclic diastereoselectivity the problem of controlling absolute stereochemistry the importance of functional group relationships are introduced early in the book and revisited throughout the text within the context of a variety of structurally unrelated natural products The book includes power point presentations to provide teachers who do not or do specialize in organic synthesis with access to well organized material they can use in the classroom with advanced students The book provides the reader with a somewhat historical overview of organic and natural products chemistry and spans synthetic methodology that dates from the 1940 s to present time It is written in a style that readers will find entertaining at times It also contains lots of useful references with complete titles provided This is much more helpful to the reader than the usual author journal year page information **Introduction to Strategies for Organic Synthesis** Laurie S. Starkey, 2012-01-18 The stepping stone text for students with a preliminary knowledge of organic chemistry looking to move into organic synthesis research and

graduate level coursework Organic synthesis is an advanced but important field of organic chemistry however resources for advanced undergraduates and graduate students moving from introductory organic chemistry courses to organic synthesis research are scarce Introduction to Strategies for Organic Synthesis is designed to fill this void teaching practical skills for making logical retrosynthetic disconnections while reviewing basic organic transformations reactions and reactivities Divided into seven parts that include sections on Retrosynthesis and Protective Groups Overview of Organic Transformations Synthesis of Monofunctional Target Molecules Synthesis of Target Molecules with Two Functional Groups Synthesis of Aromatic Target Molecules Synthesis of Compounds Containing Rings and Predicting and Controlling Stereochemistry the book covers everything students need to successfully perform retrosynthetic analyses of target molecule synthesis Starting with a review of functional group transformations reagents and reaction mechanisms the book demonstrates how to plan a synthesis explaining functional group analysis and strategic disconnections Incorporating a review of the organic reactions covered it also demonstrates each reaction from a synthetic chemist's point of view to provide students with a clearer understanding of how retrosynthetic disconnections are made Including detailed solutions to over 300 problems worked through examples and end of chapter comprehension problems Introduction to Strategies for Organic Synthesis serves as a stepping stone for students with an introductory knowledge of organic chemistry looking to progress to more advanced synthetic concepts and methodologies *Annual Reports in Organic Synthesis-1973* R. Bryan Miller, Louis S.

Hegedus, 2013-10-22 *Annual Reports in Organic Synthesis 1973* presents an annual review of synthetically useful information that would prove beneficial to nearly all organic chemists both specialist and nonspecialist in synthesis It should help relieve some of the information storage burden of the specialist and should aid the nonspecialist who is seeking help with a specific problem to become rapidly aware of recent synthetic advances In producing this volume the editors abstracted 47 primary chemistry journals selecting useful synthetic advances All reactions and methods which are new synthetically useful and reasonably general are included Each entry is comprised primarily of structures accompanied by very few comments The purpose of this is to aid the reader in rapidly scanning the book Chapters I-III are organized by reaction type and constitute the major part of the book Chapter IV deals with methods of synthesizing heterocyclic systems Chapter V covers the use of new protecting groups Chapter VI is divided into three main parts and covers those synthetically useful transformations which do not fit easily into the first three chapters The first part deals only with functional group synthesis The second part covers ring expansion and contraction and the third part involves useful multistep sequences *Solid-Phase Organic Synthesis* Patrick H. Toy, Yulin Lam, 2012-01-10 Presents both the fundamental concepts and the most recent applications in solid phase organic synthesis With its emphasis on basic concepts Solid Phase Organic Synthesis guides readers through all the steps needed to design and perform successful solid phase organic syntheses The authors focus on the fundamentals of heterogeneous supports in the synthesis of organic molecules explaining the use of a solid material to facilitate organic

synthesis This comprehensive text not only presents the fundamentals but also reviews the most recent research findings and applications offering readers everything needed to conduct their own state of the art science experiments Featuring chapters written by leading researchers in the field Solid Phase Organic Synthesis is divided into two parts Part One Concepts and Strategies discusses the linker groups used to attach the synthesis substrate to the solid support colorimetric tests to identify the presence of functional groups combinatorial synthesis and diversity oriented synthesis Readers will discover how solid phase synthesis is currently used to facilitate the discovery of new molecular functionality The final chapter discusses how using a support can change or increase reaction selectivity Part Two Applications presents examples of the solid phase synthesis of various classes of organic molecules Chapters explore general asymmetric synthesis on a support strategies for heterocyclic synthesis and synthesis of radioactive organic molecules dyes dendrimers and oligosaccharides Each chapter ends with a set of conclusions that underscore the key concepts and methods References in each chapter enable readers to investigate any topic in greater depth With its presentation of basic concepts as well as recent findings and applications Solid Phase Organic Synthesis is the ideal starting point for students and researchers in organic medicinal and combinatorial chemistry who want to take full advantage of current solid phase synthesis techniques

Design and Optimization in Organic Synthesis R. Carlson, 1991-11-21 This is the first general textbook on experimental design and optimization in organic synthesis The book presents a unified methodology for carrying out systematic studies when the objective is to develop efficient and optimum synthetic methods Strategies are included both for exploring the experimental conditions and for systematic studies of entire reaction systems substrates reagents and solvents The methodology is based on multivariate statistical techniques The following topics are treated in depth classical two level designs for screening experiments gradient methods steepest ascent simplex methods as well as response surface techniques for optimization principal components analysis and PLS modelling The book is intended as a hands on text for chemists and engineers engaged in developing synthetic methods in industrial research e g in fine chemicals and pharmaceuticals production as well as for advanced undergraduate students graduate students and researchers in an academic environment

Annual Reports in Organic Synthesis-2003 , 2003-11-19 The first three chapters of this latest volume Annual Reports in Organic Synthesis 2003 are organised by reaction type Later chapters deal with methods of synthesizing heterocyclic systems the use of protecting groups and synthetically useful transformations The final chapters deals with reviews and are divided by specific topics Clearly organised review of synthetically useful information Emphasize on rapid visual retrieval Extensive use of references Beneficial to nearly all organic chemists both specialists and nonspecialists in synthesis

Protecting-Group-Free Organic Synthesis Rodney A. Fernandes, 2018-05-25 Presents a comprehensive account of established protecting group free synthetic routes to molecules of medium to high complexity This book supports synthetic chemists in the design of strategies which avoid or minimize the use of protecting groups so as to come closer to achieving an ideal synthesis and back the global

need of practicing green chemistry The only resource of its kind to focus entirely on protecting group free synthesis it is edited by a leading practitioner in the field and features enlightening contributions by top experts and researchers from across the globe The introductory chapter includes a concise review of historical developments and discusses the concepts need for and future prospects of protecting group free synthesis Following this the book presents information on protecting group free synthesis of complex natural products and analogues heterocycles drugs and related pharmaceuticals Later chapters discuss practicing protecting group free synthesis using carbohydrates and of glycosyl derivatives glycol polymers and glyco conjugates The book concludes with a chapter on latent functionality as a tactic toward formal protecting group free synthesis A comprehensive account of established protecting group free PGF synthetic routes to molecules of medium to high complexity Benefits total synthesis methodology development and drug synthesis researchers Supports synthetic chemists in the design of strategies which avoid or minimize the use of protecting groups so as to come closer to achieving an ideal synthesis and support the global need of practicing green chemistry Covers a topic that is gaining importance because it renders syntheses more economical Protecting Group Free Organic Synthesis Improving Economy and Efficiency is an important book for academic researchers in synthetic organic chemistry green chemistry medicinal and pharmaceutical chemistry biochemistry and drug discovery

Microreactors in Organic Synthesis and Catalysis Thomas Wirth, 2008-05-05 This one stop reference is the first book on this emerging and rapid developing field with a focus on synthesis and catalysis As such it covers all aspects from academia and industry in a clearly structured way Leading experts provide the background information as an initial aid for newcomers to the field while chapters on different reaction types and industrial applications make this an equally vital resource for specialists From the contents Introduction and background Fabrication of microractors Properties and use of microreactors Organic chemistry in microreactors Homogeneous reactions including photochemical and electrochemical reactions Heterogeneous reactions Biphasic reactions liquid liquid liquid gas Bioorganic reactions Industrial applications Thomas Wirth is Professor of Organic Chemistry at Cardiff University in Wales After a postdoctoral stay with Kaoru Fuji at Kyoto University as a JSPS fellow he started his independent research in the group of Bernd Giese in Basel Switzerland He was invited as a visiting professor to various places University of Toronto Canada 1999 Chuo University in Tokyo Japan 2000 Osaka University Japan 2004 He was awarded the Werner Prize from the New Swiss Chemical Society in 2000 He is the author of about 80 publications and has written or edited 4 books

Enabling Tools and Techniques for Organic Synthesis Stephen G. Newman, 2023-08-29 ENABLING TOOLS AND TECHNIQUES FOR ORGANIC SYNTHESIS Provides the practical knowledge of how new technologies impact organic synthesis enabling the reader to understand literature evaluate different techniques and solve synthetic challenges In recent years new technologies have impacted organic chemistry to the point that they are no longer the sole domain of dedicated specialists Computational chemistry for example can now be used by organic chemists to help predict outcomes understand selectivity and decipher

mechanisms To be prepared to solve various synthetic problems it is increasingly important for chemists to familiarize themselves with a range of current and emerging tools and techniques Enabling Tools and Techniques for Organic Synthesis A Practical Guide to Experimentation Automation and Computation provides a broad overview of contemporary research and new technologies applied to organic synthesis Detailed chapters written by a team of experts from academia and industry describe different state of the art techniques such as computer assisted retrosynthesis spectroscopy prediction with computational chemistry high throughput experimentation for reaction screening and optimization using Design of Experiments DoE Emphasizing real world practicality the book includes chapters on programming for synthetic chemists machine learning ML in chemical synthesis concepts and applications of computational chemistry and more Highlights the most recent methods in organic synthesis and describes how to employ these techniques in a reader s own research Familiarizes readers with the application of computational chemistry and automation technology in organic synthesis Introduces synthetic chemists to electrochemistry photochemistry and flow chemistry Helps readers comprehend the literature assess the strengths and limitations of each technique and apply those tools to solve synthetic challenges Provides case studies and guided examples with graphical illustrations in each chapter Enabling Tools and Techniques for Organic Synthesis A Practical Guide to Experimentation Automation and Computation is an invaluable reference for scientists needing an up to date introduction to new tools graduate students wanting to expand their organic chemistry skills and instructors teaching courses in advanced techniques for organic synthesis

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