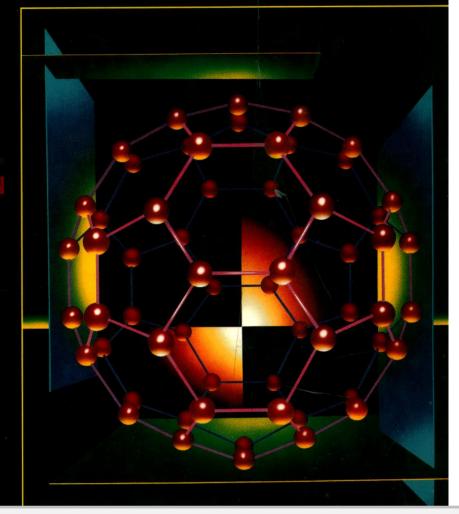
ROBERT C. ATKINS FRANCIS A. CAREY

ORGANIC. CHEMISTRY

A
Brief
Course

SECOND EDITION





ABOUT THE COVER

Roy Wiemann's cover painting depicts the spherical cluster of 60 carbon atoms known as "buckminsterfullerene." The existence of this substance was still controversial when it graced the cover of the first edition of F. A. Carey's *Organic Chemistry* (McGraw-Hill, 1987), but its isolation has since been fully confirmed.

Several figures are reproduced from other sources, and are acknowledged with the text. In addition, we wish to acknowledge the following:

The ¹H nuclear magnetic resonance spectra are reproduced with permission from "The Aldrich Library of NMR Spectra," first edition, C. J. Pouchert and J. R. Campbell, the Aldrich Chemical Company, 1975, and from "The Aldrich Library of ¹³C and ¹H FT NMR Spectra," Edition 1, C. J. Pouchert and J. Behnke, the Aldrich Chemical Company, 1993.

Infrared spectra are reproduced with permission from the "The Aldrich Library of FT-IR Spectra," C. J. Pouchert, the Aldrich Chemical Company, 1985.

Mass spectra are reproduced with permission from "EPA/NIH Mass Spectral Data Base," Supplement I, S. R. Heller and G. W. A. Milne, National Bureau of Standards, 1980.



WCB/McGraw-Hill



A Division of The McGraw-Hill Companies

ORGANIC CHEMISTRY: A BRIEF COURSE

Copyright © 1997, 1990 by The McGraw-Hill Companies, Inc. All rights reserved. Printed in the United States of America. Except as permitted under the United States copyright Act of 1976, no part of this publication may be reproduced or distributed in any form or by any means, or stored in a data base or retrieval system, without the prior written permission of the publisher.

Acknowledgments appear on page ii and on this page by reference.

This book is printed on acid-free paper.

234567890 DOW DOW 90987

ISBN 0-07-011337-8

This book was set in Times Roman by GTS Graphics.

The editors were Karen J. Allanson, Sharon Geary, and David A. Damstra; the production supervisor was Denise L. Puryear.

The cover was designed by Rafael Hernandez.

The project was supervised by Deena Cloud.

R. R. Donnelley & Sons Company was printer and binder.

INTERNATIONAL EDITION

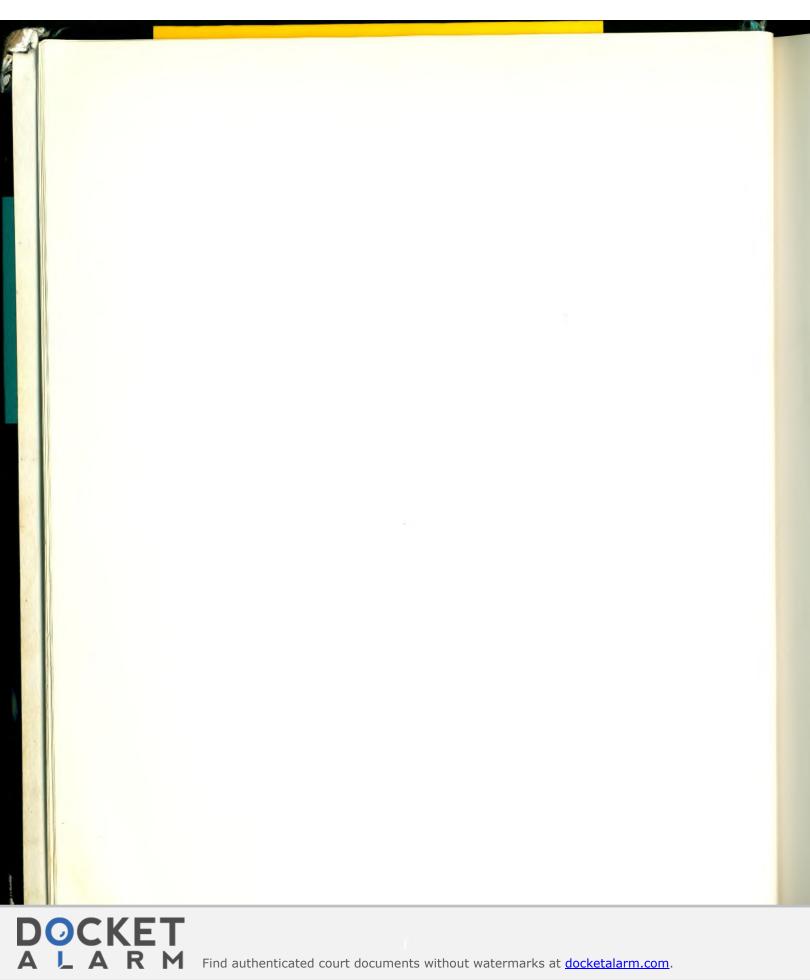
Copyright © 1997, 1990. Exclusive rights by The McGraw-Hill Companies, Inc. For manufacture and export. This book cannot be re-exported from the country to which it is consigned by McGraw-Hill. The International Edition is not available in North America.

When ordering this title, use ISBN 0-07-114005-0.

Library of Congress Cataloging-in-Publication Data is available: LC Card #96-79060

http://www.mhcollege.com







XII CONTENTS

2.4	Introduction to Alkanes: Methane	36
2.5	Ethane and Propane	38
2.6	Conformations of Ethane and Propane	38
2.7	Isomeric Alkanes. The Butanes	39
2.8	Higher Alkanes	41
2.9	Systematic IUPAC Nomenclature of Unbranched Alkanes	44
2.10	Applying the IUPAC Rules. The Names of the C ₆ H ₁₄ Isomers	44
2.11	Alkyl Groups	46
2.12	IUPAC Names of Highly Branched Alkanes	47
2.13	Cycloalkane Nomenclature	49
2.14	Conformations of Cyclopropane, Cyclobutane, and Cyclopentane	50
2.15	Conformations of Cyclohexane	51
2.16	Conformational Inversion (Ring Flipping) in Cyclohexane	53
2.17	Disubstituted Cycloalkanes and Stereoisomerism	56
2.18	Polycyclic Ring Systems	57
2.19	Physical Properties of Alkanes	58
2.20	Combustion of Alkanes	59
	Learning Objectives	60
2.21	Summary	60
	Additional Problems	63
3.1	Nomenclature of Alcohols and Alkyl Halides	69
3.1	Nomenclature of Alcohols and Alkyl Halides	69
	The Common Alcohols: Methanol, Ethanol,	
	and Isopropyl Alcohol	70
3.2	Classes of Alcohols and Alkyl Halides	71
3.3	Bonding and Physical Properties of Alcohols and Alkyl Halides	72
3.4	Acid-Base Properties of Organic Molecules	75
3.5	Alcohols as Brønsted Bases	77
3.6	Preparation of Alkyl Halides from Alcohols and Hydrogen Halides	78
3.7	Mechanism of the Reaction of Alcohols with Hydrogen Halides	79
3.8	Structure, Bonding, and Stability of Carbocations	81
3.9	Electrophiles and Nucleophiles	82
	Learning Objectives	83 84
3.10		85
	Additional Problems	03
CHA	PTER 4	
ALK	ENES AND ALKYNES I. STRUCTURE AND PREPARATION	89
4.1	Alkene Nomenclature	90
	Ethylene and Propene	92
4.2	Structure and Bonding in Alkenes	93
4.3	Stereoisomerism in Alkenes	95
1 1	Classification of Alkanas	96



DOCKET

Explore Litigation Insights



Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time** alerts and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.

