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BASIC PRINCIPLES OF ORGANIC CHEMISTRY

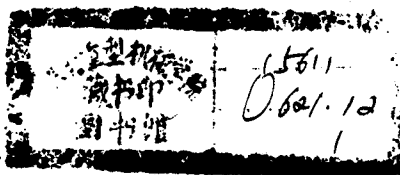
SECOND EDITION

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SECOND EDITION

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PREFACE

No period in the history of organic chemistry has been as dynamic and productive of research accomplishment as the twelve years between the completion of the first and present editions of this textbook. New reagents, new reactions, and extraordinary syntheses have been manifold. New techniques and new instruments for analysis and determination of structures, improved methods for theoretical calculations, as well as new junctures with physical, inorganic, and biochemistry, have made organic chemistry an enormously vital discipline.

But along with this "best of times," there is a "worst of times" coming from the recognition that many widely used organic compounds are more toxic than previously suspected. Some are carcinogenic; some may be destroying the ozone layer in the upper atmosphere, which protects all life from the sun's strong ultraviolet radiation; others are concentrated and persist in living tissue to as yet unknown effect. Nonetheless, our society has come to depend on synthetic organic chemicals, and we may ponder the fact that in just a few years the petroleum that makes so many useful organic compounds easily available will be in very short supply throughout the world.

It has been a real challenge for us to try to cover the elements of modern organic chemistry with sufficient breadth to anticipate the interests and needs of the future chemists, biologists, physicians, medical scientists, and engineers, who constitute the majority of those who study the subject, and, at the same time, give a balanced view of both its current accomplishments and difficulties. Our attempt has resulted in a large book that may appear unwieldy. Between editions, we often received suggestions from professors to write a book "covering just the material I need in my course," but no two ever seemed to agree on what "the" material should be. Perhaps the discipline has now progressed in breadth and complexity that no simple short text can suffice, any more than the old-fashioned grocery store can compete with the supermarket to supply the diverse needs of a modern community.

To a degree, our book has a parallel to a supermarket because not only do we cover many subjects, we cover the important ones in detail. There is no intention on our part to supply just the right amount of material for some particular course of study. Instead, we intend to provide a broad enough range of topics to accommodate almost any desired emphasis or approach to the subject. More on our objectives with regard to different possible approaches to the study of organic chemistry is given in the latter part of Section 1-5 (p. 24).

This book makes a substantial break with tradition in the matter of organic nomenclature. It was difficult to decide to do this because changes in this area are very hard to achieve, perhaps for the reason that they threaten the viability of what already is published and, indeed, even our customary forms of verbal communication. One of the authors remembers vividly the protests of his thesis supervisor to the idea of acquiescing to the admonition of a manuscript reviewer who felt that "crotyl chloride" and "methylvinylcarbinyl chloride" represented just too much of a mixing of nomenclature systems for isomeric compounds. "But we've used those names in nineteen earlier papers!" Nonetheless, organic chemists and organic chemistry will surely be better off to name these same compounds systematically as 1-chloro-2-butene and 3-chloro-1-butene.

Use of systematic nomenclature is a bit like energy conservation—we all recognize it is necessary, but we would just as soon the start be made after we are dead. The phenomenal growth of organic chemistry during the past decade and the switch by the indexes of *Chemical Abstracts* to use of much more systematic nomenclature suggests that the right time is now. The approach we will take in this book to the nomenclature problem is described in more detail in Chapter 3 (pp. 49–51).

As in the earlier edition, considerable attention is given to the application of the principles of thermodynamics, quantum mechanics, kinetics, and spectroscopy to understanding and correlating the myriad of seemingly unrelated facts of organic chemistry. Much of this material could be appropriately categorized as belonging to a "Department of Fuller Explanation," and rightly so because it represents a real attempt to achieve a genuine understanding of difficult points of fact and theory. Examples include rather detailed discussions of the properties of solvents, the differences between resonance and molecular-orbital treatments of valence, ionization strengths of acids, the origin of spin-spin splitting and kinetic effects in nuclear magnetic resonance spectra, reaction mechanisms, photosynthesis, carbohydrate metabolism, peptide-sequence determinations and peptide syntheses, enzyme action, and reactions of transition-metal compounds. It will not be possible to cover many of these topics in the usual one-year course, but many options are possible, as well as opportunities for individual studies.

Many individuals contributed to the progress and content of this edition. Special thanks are due for the suggestions of the reviewers, in particular to Professor George E. Hall of Mount Holyoke College, who read and commented not only on the whole of the first draft but also a much-revised second draft. Helpful suggestions also were received from Professors Robert E. Ireland, Robert G. Bergman, W. A. Goddard III, and John H. Richards of the California Institute of Technology, Jerome Berson of Yale University, Ernst Berliner of Bryn Mawr College, Emil T. Kaiser of the University of Chicago, J. E. Guillet of the University of Toronto, and

Dr. John Thirtle of Eastman Kodak. The students at both Caltech and the University of California at Irvine participated in class-testing the first draft and contributed significantly to the final draft. We owe them much for their patience and helpful suggestions.

Over the years, many teachers and students have taken time to send us their comments regarding the first edition, and many of these suggestions have been very helpful in preparing the second edition. Also, we are indebted to our respective colleagues for providing the encouragement that makes an endeavor of this kind possible. The revised drafts were prepared in part while one of us was on leave at Stanford University and the other at the University of Hawaii. We are very appreciative of the substantial assistance and hospitality provided by these universities.

The manuscript and its interminable revisions were typed with skill and patience by Ms. Rose Meldrum. Our thanks also go to Ms. Margaret Swingle. It was a pleasure to work with Mr. Bruce Korteblum who was the designer, Mr. Georg Klatt who did the final artwork, and Ms. Mary Forkner who was the production supervisor. The index was prepared with a HP9830 calculator system, and it would never have been possible to alphabetize and edit the 7500 entries without the help of equipment loaned by Mr. Stanley Kurzet of Infotek Systems.

Special thanks are due to Drs. James L. Hall and Jean D. Lassila (as well as Ms. Patricia Sullivan) for their seemingly tireless efforts and continual contributions through the various stages of editing and proofreading. Finally, the patience of our families during the several years that it has taken to write and produce this book is worthy of very particular mention and appreciation.

As before, we will be pleased to receive corrections and suggestions from our readers for further improvement of later editions.

May 15, 1977

John D. Roberts
Marjorie C. Caserio

CRP 4-3/02

CONTENTS

PREFACE

v

1

INTRODUCTION. WHAT IS ORGANIC CHEMISTRY ALL ABOUT? 1

1-1	A Bit of History	2
1-2	What Preparation Should You Have?	16
1-3	Why Is Organic Chemistry Special?	17
1-4	The Breadth of Organic Chemistry	21
1-5	Some Philosophical Observations	22

2

STRUCTURAL ORGANIC CHEMISTRY. THE SHAPES OF MOLECULES. FUNCTIONAL GROUPS 30

2-1	Structural Formulas	30
2-2	The Sizes and Shapes of Organic Molecules. Molecular Models	34
2-3	Classification of Organic Compounds by Functional Groups	39
2-4	Isomerism in Organic Compounds	44

3

ORGANIC NOMENCLATURE 49

3-1	Alkanes	51
3-2	Cycloalkanes	57
3-3	Alkenes, Cycloalkenes, and Alkadienes	59
3-4	Alkynes	61
3-5	Arenes	62

4

ALKANES 69

4-1	Physical Properties of Alkanes. The Concept of Homology	70
4-2	Chemical Reactions of Alkanes. Combustion of Alkanes	73
4-3	Combustion. Heats of Reaction. Bond Energies	76
4-4	Halogenation of Alkanes. Energies and Rates of Reactions	81
4-5	Practical Halogenations. Problems of Selectivity	98
4-6	Nitration of Alkanes	105

5

STEREoisomerism of Organic Molecules 110

5-1	Configurational Isomers	111
5-2	Conformational Isomers	121
5-3	Representation of Organic Structure	125
5-4	The D,L Convention for Designating Stereochemical Configurations	131
5-5	Molecules with More Than One Chiral Center. Diastereomers	133
5-6	Some Examples of the Importance of Stereoisomerism to Biology. Biological Stereospecificity	140

6

BONDING IN ORGANIC MOLECULES. ATOMIC-ORBITAL MODELS 150

6-1	Hydrogenlike Atomic Orbitals	151
6-2	Bond Formation Using Atomic Orbitals	155
6-3	Electron Repulsion and Bond Angles. Orbital Hybridization	157
6-4	Atomic-Orbital Models	162
6-5	Resonance	172
6-6	Advanced Quantum Theory of Organic Molecules	179

7

MORE ON NOMENCLATURE. COMPOUNDS OTHER THAN HYDROCARBONS 185

7-1	General Approaches to Naming Organic Compounds	185
7-2	Alcohols and Phenols: ROH, ArOH	191
7-3	Ethers, ROR'	192
7-4	Aldehydes, RCHO	192
7-5	Ketones, RCOR'	194
7-6	Carboxylic Acids, RCO ₂ H	195
7-7	Acyl Groups, R— $\overset{\text{O}}{\parallel}{\text{C}}$ —	196

7-8	Amines: RNH_2 , R_2NH , R_3N	200
7-9	Nitriles, RCN	202
7-10	The Use of Greek Letters to Denote Substituent Positions	203
7-11	Single- or Multiple-Word Names	203

8

NUCLEOPHILIC SUBSTITUTION AND ELIMINATION REACTIONS 206

8-1	Classification of Reagents as Electrophiles and Nucleophiles.	
	Acids and Bases	207
8-2	Thermochemistry of Substitution Reactions	212
8-3	General Considerations of Substitution Reactions	213
8-4	Mechanisms of S_{N} Reactions	214
8-5	Stereochemistry of $\text{S}_{\text{N}}2$ Reactions	219
8-6	Stereochemistry of $\text{S}_{\text{N}}1$ Reactions	222
8-7	Structural and Solvent Effects in S_{N} Reactions	224
	Elimination Reactions	240
8-8	The $\text{E}2$ Reaction	241
8-9	The $\text{E}1$ Reaction	248

9

SEPARATION AND PURIFICATION. IDENTIFICATION OF ORGANIC COMPOUNDS BY SPECTROSCOPIC TECHNIQUES 257

9-1	How Do We Know When an Organic Compound Is Pure?	258
9-2	Chromatographic Separation Procedures	259
9-3	Why Can't We See Molecules? Some General Considerations of Diffraction and Spectroscopic Techniques	262
9-4	Atomic Energy States and Line Spectra	268
9-5	Energy States of Molecules	270
9-6	Microwave Spectra. Rotational Spectra	270
9-7	Infrared Spectroscopy. Vibration-Rotation Spectra	271
9-8	Raman Spectroscopy	284
9-9	Electronic Spectra of Organic Molecules	287
9-10	Nuclear Magnetic Resonance Spectroscopy	295
9-11	Mass Spectroscopy	340

10

ALKENES AND ALKYNES I. IONIC AND RADICAL ADDITION REACTIONS 350

10-1	Physical and Spectroscopic Properties of Alkenes and Alkynes	351
10-2	The Reactivity of Multiple Carbon-Carbon Bonds	358
10-3	Electrophilic Additions to Alkenes	359
10-4	Orientation in Addition to Alkenes	373

10-5	Electrophilic Addition Reactions of Alkynes	382
10-6	Nucleophilic Addition Reactions	384
10-7	Radical-Chain Addition Reactions to Alkenes	386
10-8	Polymerization of Alkenes	390
10-9	Alkylation of Alkenes	397

11

ALKENES AND ALKYNES II. OXIDATION AND REDUCTION REACTIONS. ACIDITY OF ALKYNES

11-1	Oxidation-Reduction of Organic Compounds	405
11-2	Hydrogenation with Heterogeneous Catalysts	410
11-3	Heats of Hydrogenation	415
11-4	Hydrogenation with Homogeneous Catalysts	417
11-5	Hydrogenation with Diimide	418
11-6	Addition of Boron Hydrides to Alkenes. Organoboranes	420
11-7	Oxidation Reactions	431
11-8	1-Alkynes as Acids	437

12

CYCLOALKANES, CYCLOALKENES, AND CYCLOALKYNES

12-1	Nomenclature and Physical Properties of Cycloalkanes	445
12-2	Spectroscopic Properties of Cycloalkanes	446
12-3	Conformations of Cycloalkanes	448
12-4	Strain in Cycloalkane Rings	463
12-5	Chemical Properties	466
12-6	The Larger Cycloalkanes and Their Conformations	469
12-7	Cycloalkenes and Cycloalkynes	474
12-8	Nomenclature of Polycycloalkanes	476
12-9	Conformations of Decalin	480
12-10	Strain in Polycyclic Molecules	482

13

POLYFUNCTIONAL COMPOUNDS. ALKADIENES. APPROACHES TO ORGANIC SYNTHESIS

13-1	General Comments on Alkadienes	488
13-2	1,3- or Conjugated Dienes. Electrophilic and Radical Addition	489
13-3	Cycloaddition Reactions	492
13-4	Polymerization Reactions of Conjugated Dienes	504
13-5	Cumulated Alkadienes	508
13-6	Approaches to Planning Practical Organic Syntheses	513
13-7	Building the Carbon Skeleton	517
13-8	Introducing Functionality	522

13-9 Construction of Ring Systems by Cycloaddition Reactions	526
13-10 Protecting Groups in Organic Synthesis	529

14

ORGANOHALOGEN AND ORGANOMETALLIC COMPOUNDS	535
--	-----

14-1 Physical Properties	537
14-2 Spectroscopic Properties	539
14-3 Alkyl Halides	539
14-4 Alkenyl and Alkynyl Halides	548
14-5 Cycloalkyl Halides	550
14-6 Aryl Halides	551
14-7 Polyhalogenated Alkanes and Alkenes	562
14-8 Organometallic Compounds from Organohalogen Compounds	570
14-9 Properties of Organometallic Compounds	570
14-10 Preparation of Organometallic Compounds	571
14-11 Organomagnesium Compounds	576
14-12 Organomagnesium and Organolithium Compounds in Synthesis	577

15

ALCOHOLS AND ETHERS	599
---------------------	-----

15-1 Physical Properties of Alcohols; Hydrogen Bonding	600
15-2 Spectroscopic Properties of Alcohols	602
15-3 Preparation of Alcohols	607
15-4 Chemical Reactions of Alcohols. Reactions Involving the O-H Bond	612
15-5 Reactions Involving the C-O Bond of Alcohols	625
15-6 Oxidation of Alcohols	638
15-7 Polyhydric Alcohols	646
15-8 Unsaturated Alcohols—Alkenols	648
15-9 Protection of Hydroxyl Groups	651
Ethers	654
15-10 Types and Reactions of Simple Ethers	654
15-11 Cyclic Ethers	659

16

CARBONYL COMPOUNDS: ALDEHYDES AND KETONES. ADDITION REACTIONS OF THE CARBONYL GROUP	671
--	-----

16-1 The Carbonyl Bond	673
16-2 Physical Properties	678
16-3 Spectroscopic Properties	680
16-4 Some Typical Carbonyl-Addition Reactions	685
16-5 Catalytic Hydrogenation	710

16-6	Reduction of Carbonyl Compounds to Hydrocarbons	711
16-7	Oxidation of Carbonyl Compounds	712
16-8	Protection of Carbonyl Groups	715
16-9	Preparative Methods for Aldehydes and Ketones	716

17

CARBONYL COMPOUNDS II. ENOLS AND ENOLATE ANIONS.

UNSATURATED AND POLYCARBONYL COMPOUNDS 735

17-1	Enolization of Aldehydes and Ketones	736
17-2	Halogenation of Aldehydes and Ketones	742
17-3	Nucleophilic Addition Reactions of Enolate Anions	749
17-4	Nucleophilic Substitution with Enolate Anions	761
	Unsaturated Carbonyl Compounds	767
17-5	α,β -Unsaturated Aldehydes and Ketones	767
17-6	Ketenes	771
	Polycarbonyl Compounds	774
17-7	1,2-Dicarbonyl Compounds	774
17-8	1,3-Dicarbonyl Compounds	776
17-9	1,4-Dicarbonyl Compounds	778
17-10	Tricarbonyl Compounds	779
17-11	Cyclopropanones and Cyclopropenones	780

18

CARBOXYLIC ACIDS AND THEIR DERIVATIVES 788

18-1	Physical Properties of Carboxylic Acids	791
18-2	Some Chemical Properties of Carboxylic Acids	796
18-3	Reactions at the Carbonyl Carbon of Carboxylic Acids	805
18-4	Decarboxylation of Carboxylic Acids	811
18-5	Reactions at the Alpha Carbons of Carboxylic Acids	814
18-6	Functional Derivatives of Carboxylic Acids	817
18-7	Reactions at the Carbonyl Carbon of Acid Derivatives	820
18-8	Reactions at the Alpha Carbons of Carboxylic Acid Derivatives	825
18-9	Reactions of Unsaturated Carboxylic Acids and Their Derivatives	840
18-10	Dicarboxylic Acids	846

19

MORE ON STEREOCHEMISTRY 862

19-1	Plane-Polarized Light and the Origin of Optical Rotation	862
19-2	Specific Rotation	865
19-3	Separation or Resolution of Enantiomers	866
19-4	Enantiomeric Purity	870

19-5	Absolute and Relative Configuration	874
19-6	The <i>R,S</i> Convention for Designating Stereochemical Configurations	879
19-7	<i>E,Z</i> Notation	885
19-8	Prochirality	888
19-9	Optical Rotatory Dispersion. Circular Dichroism	890
19-10	Asymmetric Synthesis	393
19-11	Racemization	895

20

CARBOHYDRATES 902

20-1	Classification and Occurrence of Carbohydrates	902
20-2	The Structure and Properties of D-Glucose	908
20-3	Conventions for Indicating Ring Size and Anomer Configurations of Monosaccharides	920
20-4	Derivatives of Glucose	921
20-5	Glycosides	925
20-6	Disaccharides	927
20-7	Polysaccharides	932
20-8	Vitamin C	938
20-9	Formation of Carbohydrates by Photosynthesis	939
20-10	The Generation of Energy from Carbohydrate Metabolism	944

21

THE RESONANCE AND MOLECULAR-ORBITAL METHODS AND THEIR APPLICATIONS. PERICYCLIC REACTIONS 959

21-1	Characteristics of Simple Covalent Bonds	960
21-2	Comparison of the Resonance and Molecular-Orbital Methods	961
21-3	The Benzene Problem	966
21-4	Application of the MO Method to 1,3-Butadiene	975
21-5	Applications to Other Types of Systems	977
21-6	Which Treatment Is Better—MO or VB?	981
21-7	More on Stabilization Energies	984
21-8	Bond Lengths and Double-Bond Character	987
21-9	Hückel's $4n + 2$ Rule	989
21-10	Pericyclic Reactions	999
21-11	Evidence Bearing on the Mechanism of $[2 + 2]$ Cycloadditions	1014

22

ARENES. ELECTROPHILIC AROMATIC SUBSTITUTION 1024

22-1	Nomenclature	1024
22-2	Physical Properties of Arenes	1026

22-3	Spectral Properties of Arenes	1027
22-4	Electrophilic Aromatic Substitution	1037
22-5	Effect of Substituents on Reactivity and Orientation in Electrophilic Aromatic Substitution	1058
22-6	Orientation in Disubstituted Benzenes	1065
22-7	IPSO Substitution	1066
22-8	Substitution Reactions of Polynuclear Aromatic Hydrocarbons	1069
22-9	Addition Reactions of Arenes	1072
22-10	Oxidation Reactions	1077
22-11	Sources and Uses of Aromatic Hydrocarbons	1079
22-12	Some Conjugated Cyclic Polyenes	1084
22-13	Fluxional Compounds	1089

23

ORGANONITROGEN COMPOUNDS I. AMINES 1095

23-1	Amines Compared with Alcohols	1095
23-2	Some Naturally Occurring Amines. Alkaloids and Related Compounds	1097
23-3	Types and Nomenclature of Amines	1100
23-4	Physical Properties of Amines	1102
23-5	Spectroscopic Properties of Amines	1104
23-6	Stereochemistry of Amines	1108
23-7	Amines as Bases	1111
23-8	Amines as Acids	1120
23-9	Amines as Nucleophiles	1121
23-10	Amines with Nitrous Acid	1129
23-11	Oxidation of Amines	1141
23-12	Synthesis of Amines	1145
23-13	Protection of Amino Groups in Synthesis	1157
23-14	Carcinogenic Nitrogen Compounds	1161

24

ORGANONITROGEN COMPOUNDS II. AMIDES, NITRILES, NITRO COMPOUNDS, AND SOME SUBSTANCES WITH N-N BONDS 1167

24-1	Structural, Physical, and Spectral Characteristics of Amides	1167
24-2	Amides as Acids and Bases	1175
24-3	Synthesis of Amides	1176
24-4	Hydrolysis of Amides	1182
24-5	Nitriles	1184
24-6	Nitro Compounds	1186
24-7	Some Compounds with N-N Bonds	1197

25

AMINO ACID, PEPTIDES, PROTEINS, ENZYMES, AND NUCLEIC ACIDS 1206

25-1	Types of Biologically Important Amino Acids	1206
25-2	The Acid-Base Properties of α -Amino Acids	1212
25-3	Physical and Spectroscopic Properties	1215
25-4	Analysis of Amino Acids	1216
25-5	Reactions of Amino Acids	1221
25-6	Synthesis of α -Amino Acids	1225
25-7	Peptides and Proteins	1227
25-8	Structure and Function of Proteins	1249
25-9	Enzymes	1260
25-10	Coenzymes	1267
25-11	Enzyme Regulation	1269
25-12	Enzyme Technology	1270
25-13	Biosynthesis of Proteins	1271
25-14	Chemical Evolution	1282

26

MORE ON AROMATIC COMPOUNDS. ARYL OXYGEN COMPOUNDS; SIDE-CHAIN DERIVATIVES 1287

26-1	Aryl Oxygen Compounds	1288
26-2	Quinones	1305
26-3	Tropolones and Related Compounds	1314
26-4	Some Aromatic Side-Chain Compounds	1316
26-5	Natural Occurrence and Uses of Some Aromatic Side-Chain Compounds	1327
26-6	Correlations of Structure with Reactivity of Aromatic Compounds	1329

27

MORE ABOUT SPECTROSCOPY. IMPORTANT, LESS-COMMON SPECTROSCOPIC METHODS 1342

27-1	How Can We Understand Line-Width Differences in NMR Spectroscopy? The Uncertainty Principle	1343
27-2	Use of the Uncertainty Principle to Measure the Rates of Chemical Transformations	1345
27-3	Why Spin-Spin Splitting?	1348
27-4	Chemically Induced Dynamic Nuclear Polarization (CIDNP)	1353
27-5	Photoelectron Spectroscopy	1356

27-6	Mössbauer Spectroscopy	1359
27-7	Field- and Chemical-Ionization Mass Spectroscopy	1360
27-8	Ion-Cyclotron Resonance	1364
27-9	Electron-Spin Resonance (ESR) Spectroscopy of Organic Radicals	1366

28

PHOTOCHEMISTRY	1371
----------------	------

28-1	Light Absorption, Fluorescence, and Phosphorescence	1372
28-2	Organic Photochemistry	1378
28-3	Chemiluminescence	1395
28-4	Color and Constitution	1399
28-5	The Sensation of Color	1409
28-6	Color Photography	1410
28-7	Chemistry of Vision	1416

29

POLYMERS	1419
----------	------

29-1	A Simple Addition Polymerization. The Parts of a Polymer	1420
29-2	Types of Polymers	1421
	Physical Properties of Polymers	1425
29-3	Forces Between Polymer Chains	1425
29-4	Correlation of Polymer Properties with Structure	1430
	Preparation of Synthetic Polymers	1437
29-5	Condensation Polymers	1438
29-6	Addition Polymers	1446
29-7	Block, Graft, and Ladder Polymers	1454
29-8	Naturally Occurring Polymers	1457

30

NATURAL PRODUCTS. BIOSYNTHESIS	1460
--------------------------------	------

30-1	Classification of Natural Products	1460
30-2	Approaches to the Study of Natural Products	1461
30-3	Isoprenoid Compounds	1462
30-4	Steroids	1471
30-5	Biosynthesis	1480
30-6	Some Nitrogen-Containing Natural Products	1489
30-7	Prostaglandins	1492

31

TRANSITION-METAL ORGANIC COMPOUNDS	1504
31-1 Metallocenes	1505
31-2 Other Organometallic Compounds of Transition Metals	1509
31-3 Transition-Metal Compounds as Reagents for Organic Syntheses	1512
31-4 Some Homogeneous Catalytic Reactions Involving Transition-Metal Complexes	1517
31-5 π -Propenyl Complexes of Nickel	1521
31-6 Vitamin B ₁₂ as an Organometallic Compound	1525
INDEX	1529