1. Record Nr. UNINA9910861047103321

Autore	Smith Michael <1946 October 17->
Titolo	Biochemistry : an organic chemistry approach / / Michael B. Smith
Pubbl/distr/stampa	Boca Raton, : CRC Press, 2020
ISBN	1-351-25807-9 1-351-25806-0 1-351-25808-7
Edizione	[First edition.]
Descrizione fisica	1 online resource (399 pages) : illustrations
Disciplina	572
Soggetti	Biochemistry
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Cover -- Half Title -- Title Page -- Copyright Page -- Table of Contents -- Preface -- Author -- Common Abbreviations -- Chapter 1 Fundamental Principles of Organic Chemistry -- 1.1 Bonding and Orbitals -- 1.2 Ionic versus Covalent Chemical Bonds -- 1.3 Breaking Covalent Bonds -- 1.4 Polarized Covalent -Bonds -- 1.5 Reactive Intermediates -- 1.6 Alkanes and Isomers -- 1.7 The IUPAC Rules of Nomenclature -- 1.8 Rings Made of Carbon: Cyclic Compounds -- 1.9 Hydrocarbon Functional Groups -- 1.10 Heteroatom Functional Groups -- 1.10.1 C-X Type Functional Groups -- 1.10.2 C=X Type Functional Groups -- 1.11 Hydrogen-Bonding and Solubility -- 1.12 Rotamers and Conformation -- 1.13 Conformations with Functional Groups -- 1.14 Conformation of Cyclic Molecules -- 1.15 Stereogenic Carbons and Stereoisomers -- 1.16 Absolute Configuration [(R) and (S) Nomenclature] -- 1.17 Specific Rotation -- 1.18 Diastereomers -- 1.19 Alkene Stereoisomers: (E) and (Z)-Isomers -- Homework -- Chapter 2 The Importance of Water in Biochemical Systems -- 2.1 Hydrogen Bonding -- 2.2 Solubility -- 2.3 Water Molecules in Biological Systems -- 2.4 Acid-Base Equilibria in Water -- 2.5 Buffers -- 2.6 Structural Features That Influence Acid Strength -- 2.7 Acid and Base Character of Alcohols, Thiols, Amines and Carbonyls -- 2.7.1 Acids -- 2.7.2 Bases -- 2.8 Elimination Reactions of Alkyl Halides (E2 and E1 Reactions) -- 2.9 Acid-Base Equilibria in Amino Acids -- 2.10 Directionality --

Homework -- Chapter 3 Nucleophiles and Electrophiles -- 3.1 Nucleophiles and Bimolecular Substitution (the SN2 Reaction) -- 3.2 Nucleophilic Substitution with Alcohols, Ethers, Amines, or Phosphines -- 3.3 Carbocations and the SN1 Reaction -- 3.4 Ethers and Thioethers as Nucleophiles -- 3.5 Chemical Reactions of Carbonyl Groups -- 3.6 Biochemical Reactions of Ketones and Aldehydes.
3.7 Carboxylic Acid Derivatives and Acyl Substitution -- 3.8 Biological Hydrolysis -- Homework -- Chapter 4 Radicals -- 4.1 Structure of Radicals -- 4.2 Formation of Radicals in Organic Chemistry -- 4.3 Reactions of Radicals -- 4.4 Formation of Radicals in Biological Systems -- 4.5 Radicals in Biological Systems -- 4.6 Radical Reactions in Biochemical Systems -- 4.7 Radicals and Cancer -- Homework -- Chapter 5 Dienes and Conjugated Carbonyl Compounds in Biochemistry -- 5.1 Conjugated Dienes and Conjugated Carbonyl Compounds -- 5.2 Reactions of Conjugated Compounds -- 5.3 Conjugate (Michael) Addition -- 5.4 Enzyme-Mediated Conjugate Additions -- 5.5 Sigmatropic Rearrangement Reactions -- 5.6 Enzyme-Mediated Sigmatropic Rearrangements -- Homework -- Chapter 6 Enolates and Enolate Anions -- 6.1 Aldehydes and Ketones Are Weak Acids -- 6.2 Formation of Enolate Anions -- 6.3 The Aldol Condensation -- 6.4 Enzyme-Mediated Aldol Condensations -- 6.5 The Claisen Condensation -- 6.6 Enzyme-Mediated Claisen Condensation -- 6.7 Decarboxylation -- Homework -- Chapter 7 Enzymes -- 7.1 Enzyme Kinetics -- 7.1.1 Kinetics in Organic Chemistry -- 7.1.2 Catalysts and Catalytic Reactions -- 7.1.3 Enzyme Kinetics -- 7.2 Enzymes and Enzyme Classes -- 7.3 Oxidoreductases (EC 1) -- 7.3.1 Chemical Oxidation of Alcohols -- 7.3.2 Oxidases -- 7.3.3 Chemical Reduction of Carbonyl Compounds -- 7.3.4 Reductases -- 7.4 Transferases (EC 2) -- 7.4.1 Chemical Reactions That Incorporate Methyl, Hydroxyl, Glycosyl or Amino Groups into New Molecules -- 7.4.2 Methyl, Hydroxyl, Thiol, and Glycosyl Transferases -- 7.5 Hydrolyases (EC 3) -- 7.5.1 Chemical Hydrolysis -- 7.5.2 Esterases -- 7.5.3 Other Hydrolyases -- 7.6 Lyases (EC 4) -- 7.6.1 Bond Cleavage in Organic Chemistry -- 7.6.1.1 Decarboxylation -- 7.6.1.2 Enol Formation and the Acid-Catalyzed Aldol -- 7.6.1.3 Dehydration Reactions.
7.6.1.4 [2+2]-Photocycloaddition -- 7.6.2 Lyase Reactions -- 7.7 Isomerases (EC 5) -- 7.7.1 Chemical Isomerization Reactions -- 7.7.2 Isomerase Reactions -- 7.8 Ligases (EC 6) -- 7.8.1 Chemical Methods for Carboxylation and Nucleotide Synthesis -- 7.8.1.1 Reactions with Carbon Dioxide -- 7.8.1.2 Synthesis of Polynucleotides and Polynucleosides -- 7.8.2 Enzymatic Coupling -- 7.9 Translocases (EC 7) -- 7.9.1 Enzymatic Transport Reactions -- 7.9.2 Transport of Organic Materials -- Homework -- Chapter 8 Lipids -- 8.1 Carboxylic Acids and Esters -- 8.2 Nitrate Esters, Sulfate Esters, and Phosphate Esters -- 8.3 Lipid Classes -- 8.4 Chemical Synthesis of Esters -- 8.5 Biosynthesis and Biodegradation of Esters -- Homework -- Chapter 9 Aromatic Compounds and Heterocyclic Compounds -- 9.1 Benzene and Aromaticity -- 9.2 Benzene Is a Carcinogen -- 9.3 Functionalized Benzene Derivatives -- 9.4 Electrophilic Aromatic Substitution: The SEAr Reaction -- 9.5 Enzymatic SEAr Reactions -- 9.6 Reduction of Aromatic Compounds -- 9.7 Biological Reduction of Aromatic Rings -- 9.8 Nucleophilic Aromatic Substitution. The SNAr Reaction -- 9.9 Enzymatic SNAr Reactions -- 9.10 Polynuclear Aromatic Hydrocarbons -- 9.11 Heteroaromatic Compounds: Nitrogen, Oxygen, or Sulfur -- 9.12 Reactions of Heteroaromatic Compounds -- 9.13 Enzymatic Reactions That Generate Heterocyclic Compounds -- 9.14 Reduced Forms of Nitrogen, Oxygen, and Sulfur Heterocycles -- 9.15 Heteroaromatic Compounds with More Than One Ring -- Homework --

Chapter 10 Carbon-Metal Bonds, Chelating Agents and Coordination Complexes -- 10.1 Organometallics -- 10.2 Organometallics in Organic Chemistry -- 10.3 Biologically Relevant Metals -- 10.4 Chelating Agents -- Homework -- Chapter 11 Amino Acids -- 11.1 Characteristics of Amino Acids -- 11.2 Structure of -Amino Acids -- Homework -- Chapter 12 Peptides and Proteins.
12.1 Reactions and Synthesis of -Amino Acids -- 12.2 Amino Acid Biosynthesis -- 12.3 Peptides Are Poly(amides) of Amino Acid Residues -- 12.4 Chemical Synthesis of Peptides -- 12.5 Peptide Biosynthesis -- 12.6 Proteins and Enzymes Are Poly(peptides) -- 12.7 Peptide Degradation and End Group Identification -- 12.8 Peptidases -- Homework -- Chapter 13 Carbohydrates -- 13.1 (Poly)hydroxy Carbonyl Compounds -- 13.2 Monosaccharides -- 13.3 Mutarotation -- 13.4 The Anomeric Effect -- 13.5 Ketose Monosaccharides -- Homework -- Chapter 14 Glycosides -- 14.1 Monosaccharides -- 14.2 Disaccharides, Trisaccharides, Oligosaccharides, and Polysaccharides -- 14.3 Reactions of Carbohydrates -- 14.4 Biologically Important Glycosides -- 14.5 Biosynthesis of Carbohydrates and Glycosides -- 14.6 Biodegradation of Carbohydrates and Glycosides -- Homework -- Chapter 15 Nucleic Acids, Nucleosides and Nucleotides -- 15.1 Nucleosides and Nucleotides -- 15.2 Polynucleotides -- 15.3 Chemical Synthesis of Nucleotides -- 15.4 Biosynthesis of Nucleotides -- 15.5 Ribozymes -- 15.6 Hydrolysis of RNA and DNA -- 15.7 RNA-Mediated Programmable DNA Cleavage -- 15.8 Restriction Enzymes -- Homework -- Chapter 16 Answers to Homework Problems -- Chapter 1 -- Chapter 2 -- Chapter 3 -- Chapter 4 -- Chapter 5 -- Chapter 6 -- Chapter 7 -- Chapter 8 -- Chapter 9 -- Chapter 10 -- Chapter 11 -- Chapter 12 -- Chapter 13 -- Chapter 14 -- Chapter 15 -- Index.

Sommario/riassunto

There is a continuing demand for up to date organic & bio-organic chemistry undergraduate textbooks. This well planned text builds upon a successful existing work and adds content relevant to biomolecules and biological activity. -Professor Philip Page, Emeritus Professor, School of Chemistry University of East Anglia, UK Introduces the key concepts of organic chemistry in a succinct and clear way. -Andre Cobb, KCL, UK Reactions in biochemistry can be explained by an understanding of fundamental organic chemistry principles and reactions. This paradigm is extended to biochemical principles and to myriad biomolecules. Biochemistry: An Organic Chemistry Approach provides a framework for understanding various topics of biochemistry, including the chemical behavior of biomolecules, enzyme activity, and more. It goes beyond mere memorization. Using several techniques to develop a relational understanding, including homework, this text helps students fully grasp and better correlate the essential organic chemistry concepts with those concepts at the root of biochemistry. The goal is to better understand the fundamental principles of biochemistry. Features: Presents a review chapter of fundamental organic chemistry principles and reactions. Presents and explains the fundamental principles of biochemistry using principles and common reactions of organic chemistry. Discusses enzymes, proteins, fatty acids, lipids, vitamins, hormones, nucleic acids and other biomolecules by comparing and contrasting them with the organic chemistry reactions that constitute the foundation of these classes of biomolecules. Discusses the organic synthesis and reactions of amino acids, carbohydrates, nucleic acids and other biomolecules.