

Book Reviews

The Molecular and Supramolecular Chemistry of Carbohydrates. By Serge David. Oxford University Press, New York. 1998. vii + 320 pp. 15.5 × 23 cm. ISBN 0-19-850046-7. \$45.00.

This book provides an overview of the physical, chemical, and biological properties of carbohydrates. Its content builds upon two distinct themes and can be considered in three sections. The first, encompassing Chapters 1–4, serves to define the various types of carbohydrates and glycosides as well as to introduce the reader to sugar nomenclature. The second section, consisting of Chapters 5–10, focuses on the physical and chemical properties of sugars and their oligomers. The third, encompassing the remaining chapters, serves to introduce the reader to aspects of the physicochemical and biological properties and roles of carbohydrates.

The first chapter covers the configuration of monosaccharides and serves to define their basic chemical, chromatographic, spectroscopic, and kinetic properties. The second chapter further introduces the chemistry of monosaccharides by addressing conformational issues surrounding pyranoses and furanoses in the contexts of solid-state chemistry, NMR, the coplanar effect, and the anomeric effect. The third chapter covers alkyl and aryl glycosides as well as aminoglycosides. These classes of glycosides are presented with respect to their definitions, methods of preparation, and chemical properties. The aminoglycosides are further discussed in the context of nucleosides. The introductory chapters are concluded with Chapter 4 where an extensive overview of nomenclature is presented.

The following four chapters serve to introduce specific chemical transformations suitable for the modification of carbohydrates. In Chapter 5, reactions of the hydroxyl group are discussed. Topics in this chapter include functional derivatives where hydroxyl groups are selectively protected, alkylated, or otherwise modified. Additionally, oxidations, oxidative cleavages, and deoxygenation reactions are addressed. Chapter 6 further expands upon hydroxyl group reactions by specifically considering the anomeric position and its ability to react as a normal carbonyl group. In this chapter, oxidations, reductions, Wittig reactions, aldol reactions, and reactions utilizing free radicals are discussed. Chapter 7 provides insights relative to the previous two chapters by focusing on the conversion of one sugar to another by directly modifying the configuration of sugars. In this chapter, hydroxyl group displacements, epoxides, acyl oxonium ions, unsaturated sugars, and branched-chain sugars are discussed. Finally, Chapter 8 introduces the utility sugars have

found with respect to chiral synthesis. This chapter addresses the use of sugars for asymmetric induction and as chiral starting materials.

Chapters 9 and 10 compliment the first eight chapters by expanding into the realm of oligosaccharides. Chapter 9 introduces oligosaccharides and presents an overview of appropriate nomenclature. Additional topics include the exo-anomeric effect, chemical and spectroscopic sequencing methods, and the capability of oligosaccharides to store and carry information. Chapter 10 addresses chemical transformations and synthesis of oligosaccharides. In this chapter, specific reactions applicable to oligosaccharides are discussed. Additionally, chemical and enzymatic coupling reactions are introduced.

Complimentary to the first ten chapters, the remaining eight follow a progression of themes from the molecular interactions to the biological significance of carbohydrate structures. Chapter 11 deals with the abilities of carbohydrates to associate with anionic and cationic species. Chapter 12 introduces the reader to the special roles of sialic acid and sialylated oligosaccharides. Chapter 13 provides an overview of the roles and properties of various glycoconjugates. Chapter 14 focuses on the nature of sugar–protein complexes. Chapter 15 pushes deeper into the arena of macromolecules with respect to discussions surrounding antigens, antibodies, and lectins. With respect to biologically important carbohydrates, Chapter 16 describes the blood group antigens. Chapter 17 presents examples of the important molecular and cellular recognition events occurring in living biological systems. Finally, Chapter 18, illustrates the abilities of oligosaccharides to interact with DNA itself.

While whole books can easily be written on any one of the chapters of the present work, few books on carbohydrates serve to introduce the wide range of important physical, chemical, and biological properties of these remarkable molecules. This book is concisely written and successfully presents a broad overview of these properties. Most importantly, it should serve well as an introduction to this vast field, and I enthusiastically recommend it to anyone seeking to become acquainted with the glycosciences.

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