

strategies for the future. It can be recommended to foresters, agriculturists and researchers directly concerned with growing crops for industry and energy. It would also give an overall insight into the field for readers without technical knowledge but who intend to use land and natural resources.

However, as a constructive criticism, a subject index would certainly have facilitated its handling by the reader. Also the expensive price for one volume will make a personal purchase difficult.

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Carbohydrate Chemistry: Monosaccharides and their Oligomers. By Hassan S. El Khadem, Academic Press, Washington DC, 1989. 256 pp. ISBN 0 12 236870 3. Price £30.00.

This book is intended as a textbook for undergraduate and graduate students specialising in chemistry and biochemistry, but it could easily serve as a textbook for students reading for pharmacy and medicine courses. Moreover, it would also prove useful for students involved in research in the fields of natural product chemistry and carbohydrates. The author does not assume that the reader has mastered introductory carbohydrate chemistry and therefore any student who is not conversant with carbohydrates will be able to develop and substantiate his knowledge in carbohydrate chemistry.

The 'Introduction' (Chapter 1) gives an interesting historical background to the subject, the origin of carbohydrate chemistry having been traced back to the civilizations of antiquity. It also summarises the importance of carbohydrates and their classification. In the discussion on the determination of the structure, configuration and conformation of monosaccharides (Chapter 2), a greater emphasis is made on the modern methods used in the elucidation of structures of monosaccharides and their derivatives. This chapter also discusses the 'anomeric effect' which describes the singular behaviour of pyranose rings which deviate from that of cyclohexane derivatives. Chapter 3 illustrates the proper use of the nomenclature rules.

Surveys of the physical properties used in structure determination (Chapter 4) deals with the spectroscopic methods such as one-dimensional ^1H -, ^{13}C -, and ^{14}N -NMR spectroscopy as well as two-dimensional NMR techniques, molecular, electronic and mass spectroscopy. Optical rotation, optical rotatory dispersion and circular dichroism (extensively used in structure determination) are also discussed.

An elaboration of reactions of monosaccharides (Chapter 5) covers: the addition reactions of the carbonyl; nucleophilic substitution reactions at the anomeric carbon atom and at the less reactive non-anomeric carbon atoms; and oxidations and reductions of monosaccharides. Finally this chapter provides a section on the planning of synthetic schemes which gives the student a good opportunity of applying the knowledge gathered after studying the principal chemical reactions involved in monosaccharides. It is in chapter 5 that errors in the book become particularly apparent, e.g. page 126 (third structure) there is a missing positive charge on the carbon of the cyclic five membered dioxolenium ion. The nucleophile which attacks the carbocation (page 127) should not be a ^-OR ion but a molecule of alcohol ROH instead. The reagent ROH is not shown in the conversion from structure 4 to structure 3. The transformation of structure 5 to 3 would have been better if the equilibrium between the two was shown. More arrows ought to have been shown to give a better understanding of the reaction mechanism and scheme. Chapter 6 gives an account of wet chemical methods and physical methods in the study of the structure of oligosaccharides. In the remaining chapter the author discusses the synthesis of oligosaccharides and their chemical modification, including some novel approaches to the synthesis of these oligomers which is of immense use to chemists involved in the synthesis of bioactive glycosides of oligosaccharides. Some errors in the structures can also be detected in this chapter. The cyclic carbocation (page 224, third structure) is incorrectly drawn and has to be corrected as five-membered rather than four-membered. Again, the nucleophile ought to be ROH instead of the anion ^-OR (on pages 224 and 225). The structure of lactose is erroneously shown on page 225 with an acetyl group.

The problems given on NMR spectroscopy and other topics at the end of Chapters 4–7 are very useful to the reader, acting as refreshers to the knowledge previously gathered in these chapters. The review articles pertaining to the topics discussed in the various chapters are usefully listed in the bibliography at the end of the book.

Regarding the diagram on the cover page of the book, a structure with a six-membered ring containing an oxygen atom would have fitted a carbohydrate text better than the six-membered ring with carbons.

Generally, the book reads fairly well, is sensibly organized, and is offered to the student as a companion book containing problems.

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