

TEXTBOOK OF
ORGANIC
chemistry

P.L. Soni • H.M. Chawla



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A photograph of a laboratory setup. A hand in a white lab coat is holding a small beaker containing a green liquid. In the background, there is a larger Erlenmeyer flask with a green plant stem inside, and several test tubes in a rack. The scene is set on a white lab bench with a blurred green background.

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A decorative graphic at the bottom of the cover featuring a network of green circles connected by thin lines, resembling a molecular structure or a network diagram.

Textbook of
Organic Chemistry

A Textbook for B.Sc. and B.Sc. (Hons.) Students of Indian Universities

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Author's Acknowledgement: The writing of a Textbook always involves creation of a huge debt towards innumerable authors and publications. We owe our gratitude to all of them. We acknowledge our indebtedness in extensive footnotes throughout the book. If, for any reason, any acknowledgement has been left out we beg to be excused. We assure to carry out correction in the subsequent edition, as and when it is known.

Preface

Twenty-first century can be termed as an era of technological revolution. Advent of computers and advances in information technology and tele-communication have markedly affected our lives and the ways we approach the subject and solve the problems at the hand. During this rapidly changing scenario, we need to balance the incorporation of new advances and the existing traditional knowledge in the subject. It need be done judiciously such that we keep good traditions and embrace modernity for development and progress. We also need to adapt to the fast changing world without stressing the individuals and cater to both the tradition-bound and computer-savy students. Accordingly this new edition of *Textbook of Organic Chemistry* has been brought out in a new format and style for easy comprehension and we believe, our readers will appreciate the changes.

We sincerely feel that the revision of any book should serve two purposes. The first is to make the book easier for students to understand than the previous edition and second is to keep the contents of the book in conformity with the changing times by deleting obsolete ideas and procedures and introducing or expanding upon topics of increasing importance. These purposes are all the more important for a science like that of organic chemistry which has grown from its amoebic stage to its present robust giant structure just in 150 years and wherein new ideas are being experimented with every year. This makes the revision of *Textbook of Organic Chemistry* as almost a continuous effort. We are determined to keep the above goals in mind while revising the present book and over the years we have tried to make it more and more useful to our General and Honours students working for their first degree from the University.

In recent years, the courses in Organic Chemistry have been considered extremely important for students desirous of pursuing engineering and other technical courses and also for the ones who are heading for a career in biological and medical sciences. We have recognized this trend and therefore have included examples of biological interest at different places in the book.

Since the *Textbook of Organic Chemistry* is intended for the student, we have tried to present the matter in a brief but understandable fashion. We have attempted to 'explain' the things rather than presenting the facts in an encyclopaedic manner. Many texts, though excellent in their presentation, assume that the students can read between the lines and understand the concepts being put forth, but we feel this as an overestimate. We firmly believe that the success of any Textbook should be judged by the rate at which the weakest candidate grasps the subject-matter presented and this, in principle, is close to the well established scientific law that the rate of a chemical reaction is determined by the slowest step.

The real key to understand organic chemistry lies in its coherent organization. Therefore, we have freely used reaction mechanisms throughout the text. At places where we felt that the student's concentration might get diffused, some of the concepts have been explained in a smaller print. As student's understanding is our main goal, we have deliberately sacrificed some of the more accurate descriptions of the phenomena for little less accurate ones. For example, we have retained resonance structures rather than the more advanced, frontier molecular orbital diagrams with the feeling that once the solid foundation in the subject is laid, interested students can always go over to advanced literature.

The preparation of the new edition of the *Textbook of Organic Chemistry* gives us an opportunity not only to eliminate those mistakes that crept in the previous edition inadvertently but also to update the subject-matter. A major change in the new edition of the book that would be immediately noticed, is the addition of a number of new concepts and ideas in a chapter on Stereochemistry and spectroscopy. The chapter on Stereochemistry has been thoroughly rewritten to include modern concepts like origin

of chirality, asymmetric synthesis etc. We have also rewritten the sections on stereochemistry of cyclic compounds, correlation of different conformers of substituted cyclohexanes. Various aspects of static and dynamic stereochemistry have been dealt with rigorously and this entire chapter has been recast. This was necessitated by the increasing awareness about stereochemistry and need of the chemical world for the understanding of spatial relationship of different compounds, be they reactants or products; as it has been established beyond doubt that biological response of a compound is based essentially on its spatial recognition by the biosystem. The *E* and *Z* designations, the *R* and *S* nomenclature of stereoisomers, details of symmetry elements, etc. have been added and expanded in the revised edition. We have also included a large number of questions from latest university examinations in this edition while older list of questions have now been obviated.

Principles of mass spectroscopy, UV, IR and NMR spectroscopy have been greatly expanded and rewritten. Another obvious change in the new edition would be inclusion of spectroscopic analysis of type of compounds discussed in each chapter throughout the book. These chapters have been rewritten in order to make them conceptually clearer. New sections on Feiser-Woodward, and Feiser-Kuhn rules in UV spectroscopy, additional explanations and conclusions of various electronic transitions have been included in the chapter on spectroscopy besides the inclusion of a large number of problems and actual IR and NMR spectra of simple compounds so that students can appreciate these spectroscopic techniques better.

The chapters on biochemistry now includes structure and composition of the living cell. The basis for identity of all life forms and other topics of interest to students having a bent of mind towards biology have been added in this edition.

The chapters dealing with aromatic chemistry and heterocyclic compounds have been greatly improved over the previous editions. Mechanism of various reactions and rearrangements have been added at various places in this section of the book.

The chemistry of carbohydrates has been rewritten. Conformational isomerism in monosaccharides, disaccharides and polysaccharides has been explained and conversions encountered in carbohydrate chemistry have been provided in the new edition. Greater emphasis has been laid to explain the things so that students themselves are able to predict the chemical behaviour from the given structure. The chapter on proteins now includes principles of peptide bond formation and a discussion on primary, secondary, tertiary and quaternary structures of proteins. Newer synthesis have been added in the sections on alkaloids, terpenoids, ureides, purines and pyrimidines, and synthesis and natural dyes. Mechanistic discussion and explanations of facts have been stressed all through the book.

One of the major difficulties, the students generally feel, is with regard to solving numerical problems. In order to train them in the art of problem solving, we have included several appendices with the guidelines to solve problems. A large number of questions drawn from latest University examinations have been added at the end of each chapter of the book.

Though it is difficult to mention by name a large number of teachers and students who have been guiding the revision of the book, we take this opportunity to thank and acknowledge the assistance of all those individuals who have sent in their valuable suggestions for improvement of the book and assure them that we shall continue to incorporate all their suggestions in making this book more useful to students. We also thank many of our colleagues who have gone through the new material added in the book and Mr. D.K. Soni and Dr. M.S. Batra who took pains not only to proof-read some of the portions of the book but also in the preparation of an exhaustive index and formulating new additions to the book. We do hope that the new revised edition of the book will be more useful to students and teachers and we would continue to receive suggestions for its further improvement.

AUTHORS

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