TEXT-BOOK OF ORGANIC CHEMISTRY

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649116966

Text-book of organic chemistry by Henry Leffmann & Charles H. La Wall

Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

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HENRY LEFFMANN & CHARLES H. LA WALL

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OF

ORGANIC CHEMISTRY

BY

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WITH ILLUSTRATIONS AND EXPERIMENTS

PHILADELPHIA

P. BLAKISTON'S SON & CO.

1012 WALNUT STREET

1905

PREFACE.

This book is offered as an aid to the study of organic chemistry in connection with general and professional college courses. The difficulty in the preparation of such a work is to determine what to exclude. We have endeavored to give consideration to the more important features of the science, especially in its applications. Polarisation of light has been treated in some detail on account of the importance of it in the study of molecular structure.

Some descriptive topics that are often passed over very briefly have been given considerable space. Among these are to be noted the sections on Enzyms, Purins, Alkaloids and Proteids.

The experiments have been selected with a view of illustrating all the important types of organic compounds and reactions, and at the same time avoiding danger to the student and tediousness and complexity of manipulation.

All temperatures are centigrade.

119 South Fourth St., Philadelphia,
October, 1904.

H. L.
C. H. L.

CONTENTS.

ORGANIC CHEMISTRY.

PRINCIPLES.

ORGANIC CHEMISTRY is primarily the chemistry of substances produced by living tissues. These are very numerous, and other bodies can be obtained from them, which are analogous to the primary organic bodies, and are included in the same groups. Transformations and modifications may be carried so far as to produce substances which are clearly inorganic, consequently it is not possible to establish a distinct boundary between inorganic and organic chemistry. It was formerly supposed that organic bodies are distinct in that the original compounds could only be produced by vital action, but, in 1828, Wöhler succeeded in producing urea by heating ammonium cyanate, and thus set aside the supposed distinction. Since that time many similar results have been obtained, and it is now generally believed that the chemical affinities concerned in the formation of compounds by living tissues are the same as those operating in inorganic bodies. It must, however, not be supposed that the chemistry of vital action has been solved, or even brought into entire analogy with inorganic chemistry. Many points yet remain to be explained.

A characteristic of the products of vital action is that they all contain carbon, hence it has been proposed to sub-

stitute for organic chemistry the title "Chemistry of the Carbon Compounds." No special advantage is gained by this. Moreover, several compounds containing silicon in combinations analogous to natural organic bodies have been obtained, so that the later title is equally insufficient.

Carbon, hydrogen, oxygen and nitrogen are most abundant in organic compounds; sulphur and phosphorus are present in the complex forms that are found in tissues of higher function. Iron is found in several, among which are the coloring matters of blood and green vegetable tissue. Copper is also noted in a few cases. By laboratory methods many substances have been obtained into which other elements, *e. g.*, chlorine, bromine, iodine, mercury and arsenic, have been introduced. These are often analogous in many ways to natural organic bodies, but not equivalent to them in biologic function.

The following list of bodies from natural sources will illustrate the degrees of complexity exhibited by organic compounds:

$C_{10}H_{16}$ ..... Terpene.
$C_{12}H_{22}O_{11}$ ..... Cane sugar.
$C_{10}H_{14}N_2$ ..... Nicotine (from tobacco).
$C_{17}H_{19}NO_3$ ..... Morphine (from opium).
$C_2H_7NSO_3$ ..... Taurin (from bile).
$C_3H_9PO_6$ ..... Glycerophosphoric acid (from brain tissue).
$C_{32}H_{32}FeN_4O_6$ ..... Hematin (from blood corpuscles).

Proximate and Ultimate Composition.—The tissues of plants and animals, or the immediate products of their transformations, are generally mixtures of several independent substances. Butter is a mixture of four or five fats common rosin contains two or sometimes three distinct bodies; opium and Peruvian bark are still more complicated, and brain and muscle structures are so com-