

**OUTLINES OF THE COURSE
OF QUALITATIVE
ANALYSIS FOLLOWED IN
THE GIESSEN LABORATORY**

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Outlines of the Course of Qualitative Analysis Followed in the Giessen Laboratory by Henry Will

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HENRY WILL

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OUTLINES *Robert T. Edes.*

OF THE COURSE OF

No. 16.

QUALITATIVE ANALYSIS

FOLLOWED IN THE GIESSEN LABORATORY.

BY

HENRY WILL, PH.D.

PROFESSOR EXTRAORDINARY OF CHEMISTRY IN THE UNIVERSITY OF GIESSEN.



WITH A PREFACE

BY BARON LIEBIG.

BOSTON:
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P R E F A C E

TO THE AMERICAN EDITION.

THE course of instruction in Chemical Analysis pursued at Giessen has been adopted in Great Britain and throughout Europe. The last edition of the "Qualitative Analysis," by Fresenius, a former assistant of Baron Liebig, was simultaneously published in German, French, and English. This circumstance, in connection with the fact that four German editions of it have already been sold, shows at the same time the demand for chemical knowledge, and the excellence of the method of instruction.

Dr. Will, now Professor Extraordinary in the University at Giessen, has for many years been an assistant of Baron Liebig, being at first associated with him in his private laboratory, and in giving instruction in practical chemistry; but more recently, in consequence of the increase of the school, he has taken the direction of a separate laboratory. His long experience has eminently qualified him for the task of preparing a text-book, and the volume appearing under his name, presents in compact form and arrangement, the course introductory to that of the "Hundred Bottles."

These consist of solutions and solids, without labels, whose chemical contents are to be ascertained. Before entering upon their examination, the student has, with the aid of a text-book and a teacher, become more or less familiar with the reactions of the bases, acids, and elementary bodies of which they are composed, but only in their isolation; he now comes to recognize them in their combinations, and in the presence of other bodies tending to obscure their reactions. This calls

into exercise all his previous acquisitions. The contents of the bottles become more and more complex as he advances from 1 to 100. In the first ten solutions he seeks only an acid; in the second ten, perhaps only a base. The next twenty are solids, and both an acid and a base are to be sought in each bottle. Then occur bottles, each containing several bases, and then others, each containing several acids; and thus increasing, till the last ten of the hundred may be found to contain from ten to twenty ingredients. The progressive development of the taste and capacity for chemical analysis, and of the love of order and neatness, which this system secures, make acquisition and instruction grateful.

At the conclusion of this course, pharmaceutical preparation and determinations in quantitative analysis commence. The operator has become expert in manipulation; he has acquired patience and perseverance for repetition where doubt existed, has gained confidence in the reagents; and the most important qualification to the young analyst, conscientiousness in attending faithfully to the minutest details upon which a result may depend, has been developed.

Such is, in general, the elementary course at Giessen, and more or less in all the prominent schools of chemistry throughout Europe.

The text-book of Professor Will was translated into English for the immediate use of the Royal College of Chemistry recently established in London, under the direction of Professor Hoffman. Its chief advantages are its compact and systematic arrangement, and its adaptation to the successive wants of the student, who is led by it to the constant exercise of his acquisitions. It has been adopted in the University at Cambridge, in the United States.

P R E F A C E.

IN order to benefit by a course of practical instruction in chemical analysis, the student must necessarily obtain a preliminary acquaintance with the general principles and theories of the science.

The present work is designed for use in the laboratory ; consequently everything which does not immediately refer to the processes of analysis is very properly excluded. If we consider, as we ought, the main design of practical instruction in a chemical laboratory, to be the exercise of reflection and judgment in order to a profound understanding of the scientific bases upon which the separation of bodies from each other depends, it is obvious that a work adapted for laboratory use must differ from one designed for self-instruction. In books of the latter kind, it must be assumed that the reader has no previous knowledge ; they must therefore include a description of a multitude of things not absolutely relevant to their professed object : with some of these the student ought to become acquainted by attendance on lectures, or by reading an elementary work on the science, such as the preparation of reagents ; with others, (apparatus and instruments,) he becomes familiar immediately upon his entering the laboratory. Those therefore

must be considered the best of books of this kind, which most completely supersede the necessity of a teacher; and necessarily, on this ground, the great advantages derived from oral instruction, and the excitement of the student's own power of observation and reflection, are sacrificed to the mere mechanical course of operations, which leads securely to the detection of individual bodies.

The want of an introduction to chemical analysis, adapted for the use of a laboratory, has given rise to the present work, which contains an accurate description of the course I have followed in my laboratory with great advantage for twenty-five years. It has been prepared at my request by Professor Will, who has been my assistant during a great part of this period. I hope and believe that it will be acceptable to the English public.

JUSTUS VON LIBBIG.

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