

**A BRIEF INTRODUCTION TO
QUALITATIVE ANALYSIS:
FOR USE IN INSTRUCTION IN
CHEMICAL LABORATORIES**

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A brief introduction to qualitative analysis: for use in instruction in chemical laboratories by
Ludwig Medicus & John Marshall

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BY
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TRANSLATED FROM THE TENTH AND ELEVENTH GERMAN
EDITION, WITH ADDITIONS.

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FIFTH EDITION.

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TRANSLATOR'S PREFACE.

THE merit of Medicus's "Qualitative Analysis," and its popularity, which is shown by its having already passed through five editions in the German language, led to this translation.

The translator has taken the liberty of rearranging the elements in the first part of the book into groups, to correspond with their precipitation by group reagents, and also of adding two tables and amplifying the text to the extent of about forty pages.

J. M.

PHILADELPHIA, 1892.

PREFACE TO THE SECOND EDITION.

IN the second edition a number of additions and changes have been made in the parts treating of the methods of procedure in the separation of the bases into groups. A table showing the solubility of many of the salts of the commonly occurring metals has also been added.

J. M.

PHILADELPHIA, 1892.

PREFACE TO THE FOURTH EDITION.

SOME changes in the text have been made in the fourth edition, and an additional method for the separation of the members of the third group has been inserted.

J. M.

PHILADELPHIA, 1896.

PREFACE TO THE FIFTH EDITION.

IN this edition, which is from the tenth and eleventh German edition, there have been incorporated some general introductory remarks on the theory and behavior of ions. Changes have been made in various parts of the book to correspond with the theory of ions. In the fourth edition two methods were given for the separation of the bases of the third and fifth groups. Experience in the laboratory has determined which of the two methods of separation seemed better adapted for use by students, and, therefore, in the case of both of these groups the method which seemed least adapted was omitted from the present edition. To the Appendix have been added two examples of the behavior of the rare elements contained in thorite and lead selenide.

PHILADELPHIA, 1903.

J. M.

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INTRODUCTION.

WHEN the chemist has to examine some compound or mixture of unknown composition, he may put the questions, What elements are contained in the former? What are the component substances of the latter? The processes which he must use in order to obtain the answers to these questions, *i. e.*, to ascertain the elements and component substances, belong to the domain of Qualitative Analysis.

Qualitative analysis aims only to determine what substances are actually present, and leaves undetermined the amounts present. To ascertain the amounts is the province of Quantitative Analysis.

The object of this book is to treat of the systematic procedure for the detection of the bases and acids, together with the requisite preliminary tests and the methods of solution and decomposition. The systematic procedure, however, is preceded by a brief description of the behavior of the more important bases and acids. The behavior of the rarer elements is briefly described and illustrated by examples in the Appendix. The atomic weights⁽¹⁾ are expressed first as compared with Oxygen = 16, and second, in parentheses, as compared with Hydrogen = 1.

General Remarks.—All salts (the true salts, like KCl and KNO₃, and also the hydroxyl salts or bases, as KOH, and the hydrogen salts or acids, as HCl) when in aqueous solution are more or less separated into their ions. Sufficiently diluted solutions of potassium chloride, for example, contain the ions; *i. e.*, potassium as cation ($\overset{+}{K}$ or K⁺),

¹ International.