

**THE PRINCIPLES OF PHYSICAL SCIENCE:
DEMONSTRATED BY THE STUDENT'S
OWN EXPERIMENTS AND
OBSERVATIONS, IN THREE VOLUMES,
VOL.II: THE PRINCIPLES OF CHEMISTRY
AND MOLECULAR MECHANICS**

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The Principles of Physical Science: Demonstrated by the Student's Own Experiments and Observations, in Three Volumes, Vol.II: The Principles of Chemistry and Molecular Mechanics by Dr. Gustavus Hinrichs

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DR. GUSTAVUS HINRICHS

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HINRICH'S
PRINCIPLES OF CHEMISTRY
AND
MOLECULAR MECHANICS.

The form, dimensions, and motions of the chemical molecules, are determined by the thermometer and the goniometer — as the form, dimensions, and motions of the planets are determined by the pendulum and the theodolite.

THE
PRINCIPLES OF CHEMISTRY

AND

MOLECULAR MECHANICS,

BY

DR. GUSTAVUS HINRICHS,

Professor of Physical Science in the State University of Iowa. Member of
several Scientific Societies of France and Germany.

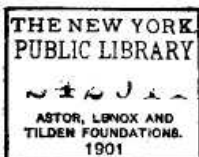
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PREFACE.

THIS volume is submitted to the scientific public as an introduction to *Molecular Mechanics*, and to the student as a guide in the study of the general *Principles of Chemistry*.

The more general results of nearly twenty years' labor in molecular mechanics, are here for the first time presented in logical continuation of what but too often is termed "modern chemistry." It is hoped that this method of exposition will lead to a more generous recognition of mechanics by chemists, and tend to open new and promising fields of research.

We trust that the student will find this book not only a safe guide, teaching nothing new that has to be unlearned, but also a profitable guide, leading him up to those higher principles from which the best view of the field of facts can be enjoyed.

Formerly, in the absence of general principles, general methods of operation, and general laboratory practice, there was some reason for the striking similarity between cook-books and chemical treatises for students. Now, the general student, having practiced the *Elements of Chemistry* in the laboratory, can profitably master a work so unlike a cook-book as the present volume. The hints here given for work will be amplified in the laboratory in those cases which the student may want to practice. Thus, the *method of research* and of scientific verification will be fully acquired — without consuming all the time at disposal for the *science of chemistry* in the enumeration of dry, and yet insufficient, details of operations not understood.

Full collections of compounds, models, charts, etc., etc., are, of course, necessary, where this book is used in colleges or universities.

May this book, the result of many years of thought and work, be useful in the cause of science.

ORIGINAL CONTRIBUTIONS TO MOLECULAR MECHANICS
CONTAINED IN THIS VOLUME.

1. *Graphical and Stereographical Formulæ.*
2. *Rotation of Molecules.*
3. *Moment of Inertia of Molecules.*
4. *Motions of Molecules in the three States of Aggregation.*
5. *Specific Heat of Vapors.*
6. *Molecular Volume of Liquids (Alcohol Series).*
7. *Boiling Point of Series.*
8. *Boiling Point of Isomers.*
9. *Determination of Chemical Constitution (Form) by the Thermometer.*
10. *Determination of Molecule of Binaries and Ternaries.*
11. *Determination of Crystal Form from Molecule.*
12. *Selection of Crystal Symmetry.*
13. *Molecular Perturbations.*
14. *Classification of the Elements.*
15. *Stas' Determinations as Secondary Perturbations.*
16. *Atomic Weight and Atomicity of Elements Calculated from General Constitution.*
17. *Co-ordinates of Atoms in Molecule.*
18. *Law of Pressure, in Ebullition and Dissociation.*
19. *Law of Probability Regulates Dissociation (Elementary Demonstration).*
20. *Law of Probability Regulates Chemical Velocities.*

For additional contributions, see Chronological List of Publications, at the close of this volume.

♦

CONTENTS.

| | PAGE. |
|--|-------|
| INTRODUCTION, | 1 |
| PART I. THEORETICAL CHEMISTRY. | |
| A. MOLECULAR STATICS. | |
| I. Chemical Atoms, | 5 |
| II. Chemical Molecules, | 17 |
| III. Atomic Heat, | 27 |
| IV. Atomicity, or Valence, | 35 |
| V. Substitution, | 40 |
| VI. System of Binaries and Ternaries, | 43 |
| VII. Serial Radicals, | 48 |
| VIII. Chemical Constitution, | 55 |
| IX. Alcohol Serials— | |
| a. Monovalent Radicals, | 68 |
| b. Polyvalent Radicals, | 78 |
| c. Higher Radicals, | 80 |
| X. Aromatic Serials, | 81 |
| XI. Complex Serials-- | |
| a. Carbonaceous, | 89 |
| b. Nitrogenous, | 98 |
| c. Fossil, | 100 |
| XII. Synthesis of Serials, | 103 |
| B. MOLECULAR DYNAMICS. | |
| XIII. Molecular Rotations, | 110 |
| XIV. Ebullition, | 121 |
| XV. Dissociation, | 131 |
| XVI. Caloration, | 142 |
| XVII. Crystallization, | 165 |
| XVIII. The Element-Atom an Atom-Crystal, | 178 |
| PART II. SYSTEMATIC CHEMISTRY. | 183 |
| PART III. APPLIED CHEMISTRY. | 186 |
| APPENDIX, | 190 |

INTRODUCTION.

1. *The Principles of Chemistry* here to be presented, comprise a concise exposition of those *general principles and laws of the science of chemistry* which should be understood by all who pretend to a liberal education. Hence the specialties, of however high an importance to the specialist, whether in pure chemical science or its innumerable applications, cannot find a place in this volume.

2. The subject of this treatise will be presented in three parts:

Part first will treat of the general principles of *theoretical chemistry*, giving the general laws of chemical processes, the formulae representing the compounds, and the physical phenomena manifested during their formation.

The second part will contain a concise synopsis of *systematic chemistry*, comprising a short description of the most important chemical compounds, in systematic order.

The third part treats of the general principles of *applied chemistry*, enabling the student to understand the principal processes of the chemical arts.