BOOK REVIEWS

Chemistry Calculations: With a Focus on Algebraic Principles

Alexander Vavoulis, California State College at Fresno. Holden-Day, Inc., San Francisco, 1966. xii + 140 pp. Figs. and tables. 16 × 23.5 cm. Clothbound, $4.95; paperbound, $2.50.

A statement that is making the rounds these days is "Biology is becoming mostly physics; physics is becoming mostly mathematics; and mathematics is becoming mostly impossible." This little book belies that statement.

When the author makes the statement in the preface that "This book is intended for any beginning student who has difficulty in applying algebra to chemistry problems," he means exactly what he says.

Each of the short chapters introduces an algebraic concept explicitly in words and with examples. The application of each concept to chemistry follows immediately demonstrating how the single mathematical idea per chapter may be applied to chemical problems commonly used in general chemistry courses. At the end of each chapter there is a set of "Algebra Problems" and of "Chemistry Problems."

Each chapter varies in length from three to ten pages depending upon the material. A selected list of chapter titles which might be of particular interest to the beginning student are: Fundamental Principle (manipulation of fractions), Monomials (large and small numbers), Rectangular Coordinates (linear equations and slopes, intercepts are missing), Systems of Equations (solving simultaneous equations by several methods), Irrational Numbers (ratios), Quadratic Equations (equilibria), Functions and Graphs (constants and variables), Logarithms (the usual operations, its use in pH and the Nernst equation), Natural Logarithms (conversion; curves), Significant Figures (good emphasis), and Solving Problems (good suggestions). The various appendices contain the Greek Alphabet, Common Abbreviations, Physical Chemical Constants, Metric Units and Conversion Factors, Atomic Weights, and various useful tables of vapor pressures, equilibrium constants, four place log tables, and the answers to the even number problems. The index is quite adequate.

The book is very readable and should provide many students with a feeling of confidence in handling their freshman chemical calculations. In fact one wonders whether the author might not have other such valuable short books in mind in relating such topics as geometry, trigonometry, and calculus to chemical problems of the potential chemist.

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Understanding Chemistry. Volumes 1–5

Gordon M. Barrow, Case Institute of Technology, Cleveland, *et al.* W. A. Benjamin, Inc., New York, 1967. Vol. 1, Chemical Quantities, vi + 122 pp.; Vol. 2, Chemical Bonding, viii + 120 pp.; Vol. 3, Chemical Reactions, x + 114 pp.; Vol. 4, Chemical Equilibria, viii + 120 pp.; Vol. 5, Chemical Systems, x + 150 pp. Figs. and tables. 14 × 21.5 cm. $1.75 each vol.

This is a second edition, but in five volumes, of the earlier two volume, "Programmed Supplements for General Chemistry," reviewed in THIS JOURNAL, **43**, 275 (1966). The purpose, as with all good programmed instruction for chemistry students, is to help students who have varied backgrounds and abilities each to develop for themselves a common background at a beginning level which is acceptable to the typical but demanding professor of a modern chemistry course.

As with the first edition, these volumes are designed for use by the student as supplements to his text, in no sense replacing it. It is expected by the authors that the unifying threads appropriate to the complete development of the subject will be provided by the text and other books, and by the instructor. Typical uses of programmed instruction in chemical education are described in the reference cited above.

Although the topics now presented are the same as in the first edition, the treatment is different. The earlier edition was programmed in large steps in many places; now many of the steps from one frame to the next are smaller. The level of understanding to be achieved by the student remains the same as before. Hence, it could be concluded that so-called poorer students ought to find this edition more helpful. In my opinion, most students who cannot use programmed instruction effectively are identified by the absence of a personal drive, by a reluctance to apply themselves diligently to any book (or to the lab bench), not by their deficient mental abilities. But for the very few who suffer more from mental dullness than from mental sloth, the smaller steps in this edition will be helpful. (These remarks should not be misunderstood—the steps are still quite challenging to a beginner in many instances, though to one who knows the subject well they might seem to be otherwise.)

For this reviewer to select one of the five volumes as unique (see below) could be interpreted as a not-so-subtle attempt to imply that the other four are not as useful as certain competitive publications. This is emphatically not true. I regard these other four as valid and stimulating competition to the other competitive programmed materials, including my own works. But volume 2 is unique; there is nothing comparable on chemical bonding, at this level, otherwise available. Volume 2 takes the student from the simple idea that electrons exist as part of an atom to the concept of electron configuration. After the student has learned how to figure out the configuration of any atom in its ground state he applies this knowledge to the shape (three dimensional probability distribution) of atomic orbitals, and then

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