
Explorations in Chemistry. *Charles A. Gray.* E. P. Dutton, New York. 1965. Diagrams, bibliography and index. 221 p. \$5.95.

Sub-titled "Over 150 experiments and the chemistry behind them, including complete instructions for setting up a home laboratory," this "do-it-yourself" text is aimed at interested high school students who are capable of following directions. Safe laboratory practices are emphasized. Mineral acids are not used, since the experiments depend upon NaHSO_4 (unfortunately still called sodium bisulfate). Parents will also be pleased that the cost for the recommended collection of apparatus, which is far more usable than that provided by any commercial "chemistry set," is only about \$25.00.

Directions for experiments are embedded in the text, and are used to reinforce and illustrate the points made concerning chemical reactions. Gray introduces chemical notation and discusses the nature of the chemical bond immediately after he has described how the laboratory should be set up. Properties of solids, liquids, and gases are followed by a short discussion of chemical equilibria; chemical reactions are discussed according to periodic table groups. Organic reactions are lightly treated, and the book closes with 23 pages of suggestions for more advanced projects (generally requiring more equipment). A teacher faced with suggesting worthwhile chemistry projects would find it useful.

The text is reasonably up to date, in spite of its conventional arrangement, but the experiments are descriptive, rather than concept-oriented. There are minor flaws in theory: aqueous hydrochloric acid is said to be partially ionized; sulfur trioxide molecules are said to jump back and forth between their various resonance forms; ammonia gas dissolved in water exists as $\text{NH}_3(\text{HOH})$, contrary to the information on page 102. Reversibility of chemical reactions is curiously defined. One Kekulé form is used to represent benzene; since the resonance concept had been introduced early, it is a pity that the discussion was not extended to benzene.

There are some difficulties in the laboratory directions: on page 66 the reader is told to use "a measure," but the construction of the "measure" (a glass spoon) is not explained until page 74. The initial equipment list recommends the purchase of two graduated cylinders, which are needed only in the advanced projects. The stock list omits the necessary pH paper (the pH concept is not discussed in meaningful detail). And there is no suggestion that the young chemist keep a written notebook record of his experiments.

Gray's book should bring a great deal of pleasure to any youngster seriously interested in science and, if pursued to the end, will provide him with a good overview of some of the materials and concepts with which a chemist works.

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