

## INTRODUCTION

This laboratory reference book and manual of experimental physical chemistry has resulted from the joint efforts of a group of experienced teachers from MACTLAC. The name MACTLAC, the Midwestern Association of Chemistry Teachers in Liberal Arts Colleges, speaks for itself. No apology is offered for the introduction of a new manual. We believe the time is ripe for such a manual and seek merely to express the philosophy upon which it is based.

In the past, physical chemistry laboratory experiments have been largely of two types: experiments intended to illustrate theoretical principles, and those teaching methods of measurement of physical constants. Both of these goals, worthy as they are now seem increasingly fruitless in view of the growing sophistication of college seniors. Ideas and equipment, unfamiliar to senior students twenty and even ten years ago, are often met with as early as the freshman level, if not in actual practice at least in films and textbook illustrations.

A new approach is needed, and indeed is being used in many of the colleges. This manual has as its principal goal the stimulation of the more mature student in learning to utilize his previously acquired knowledge in the solution of chemical problems researchwise. In parallel fashion, some experiments are designed to develop the independence and initiative of the student not quite ready for project work.

Students of seemingly equal intelligence vary widely in their ability and perception in dealing with physical apparatus. This is more than a matter of physical dexterity or eye-hand coordination.

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tion. There is often the need of learning "tool" utilization, both mathematical and physical, and even the skill of transferring concepts from print or diagrams to the actual equipment. This can only be acquired through actual practice, hence a number of routine experiments designed with this in mind is justified. However, experiments using physico-chemical methods rarely turn out to be routine even though the directions are quite explicit. Mistakes occur and unforeseen difficulties crop up. It is at this point where an alert instructor can turn an otherwise prosaic experiment into a stimulating experience either by guiding the student personally to his own solution or by referring him to the proper portion of the reference section.

The reference section is useful for another purpose. Most students and even some instructors need to know not only the purpose of equipment but also its limitations and preferred method of application. Even the most experienced can gain something from the knowledge and insight of his colleagues in this regard. So the reference section is considered fundamental to the usefulness of this manual. It is intended to serve both as an introduction to the experiments and as a supplement.

The success of a chemist of the future will depend not only upon his theoretical knowledge, but also upon his ability to understand and utilize efficiently the growing number of instrumental methods at his command. A good grounding in the principles of physical measurements is the first step to future mastery.