Preface

Many scientists and philosophers have written about the importance of experience and observations. It is usually recognized universally, that laboratory forms the heart of any science course. In the study of physics, there are several resources available to students. These include textbooks, lectures, problem solving and laboratory exercises. The laboratory provides a unique opportunity to validate physical theories in a quantitative manner. Laboratory experience teaches a student the limitations inherent in the application of physical theories to real physical situations. It teaches the role that experimental uncertainty plays in physical measurements and introduces ways to minimize experimental uncertainty. In general the purpose of these laboratory exercises is both to demonstrate some physical principle and to allow the student to learn and appreciate the techniques of careful measurement. In addition, it makes the student to be familiar with facilities and equipments and how to use them to set up an experiment.

During my years of teaching as a staff member in the physics department in the college of science university of Sulaimani since 1975. Part of my duty was supervising experimental work that is, laboratories. During this period and in all laboratories which I have supervised it, I always found that there is a lack of a valuable and collective reference or source book that cover and guide students in setting and performing experiments, that is a text book which satisfy laboratories requirements.

I am quite sure that we all remember that one of the greatest problems facing any one who is in charge in preparing experiments of even one semester is the lack or shortage of equipment. Whenever he is preparing a list of suitable experiment he will soon find that most of his experiments cannot be setted, because there is no equipment for them. To overcome this problem I have introduced, in this book, some fundamental or basic experiments with simple tools which minimum equipment or even some of them can be made locally.

With this recognized shortage of the equipments and unavailability of a text book in practical physics. Which covers a wide scope of experiment from which the lecturer can choose a set which suits his requirement, I found that it is useful and constructive to sum up all may experience and knowledge in this field and presented in a book. Therefore this book, may delicate reader, is the product of my creative efforts along these lines in the past almost 40 years. I offer it to my fellow teachers and their students as the out come of my experience.

The organization of the book makes for logical presentation of its subject matter. These experiments designed to give students real experiences. The book is divided into two parts; part one supplies the required general theoretical background necessary for the experiments, part two covers 104 different experiments in the fields of, thermodynamics, heat, kinetic theory of gases and thermal properties of matter and other related fields. The book is prepared so that there is a sufficient specific experiment for fields such as, chemistry, biology, mathematics and geology, apart from physics. Each experiment is designed as a complete independent unit.

To enhance the value of the book as a learning tool each experiment is provided with a comprehensive account of the theory on which the experiment is built up or depend on, parallel with derivation of the required formula or mathematical relationships between the variables or the parameters in the experiment. In addition each experiment is supplied with a number of important notes and questions related to the experiment by one way or the other.

Finally, it should, be mentioned that an appreciable number of experiments have been designed for the first time. They were, to my knowledge, not included in any experimental text books so far available.

I hope that this book will be found useful by the students and teachers in various universities and institutions, and I trust that you the reader will enjoy it as much as I have enjoyed writing it.

I am deeply indebted to my wife and children's for their love, support and long term scarifiecs.

May grateful thanks are due to ***Mr. Ranjdar M. Abdullah*** for his care and patience in printing the book in time. The author will be grateful for any constructive suggestions to increase the usefulness of the book.

HMA
Sulaimani
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