Problems and questions in physics

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PROBLEMS AND QUESTIONS IN PHYSICS
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IN

PHYSICS

BY

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PREFACE

There is perhaps little that need be said prefatory to a work of this character. The class-room experience of the authors leads them to believe that any text in Physics needs to be supplemented by problem work in considerable variety. A numerical example in Physics serves a manifold purpose. It takes the mathematical expression of a physical law out of the realm of mere abstraction, by emphasizing the connection between such a law and the phenomena of daily observation. At the same time, it gives the student an idea of the relative magnitude of physical quantities and of the units in which they are measured. Lastly, it shows him the usefulness of his previously acquired mathematical knowledge, while impressing upon him the limitations which must be put upon this knowledge when applied to physical relations. There would seem, therefore, to be no lack of justification for the not inconsiderable labor of writing an extensive series of problems.

In the preparation of the following pages, the authors have introduced a number of features which have seemed good to them, and, it is hoped, may meet with general favor. The problems are numbered consecutively throughout the book in Arabic numerals. The paragraphs of the Introduction are numbered in Roman numerals. This contributes to easy reference. All tables of physical constants are placed in the Introduction. To work the problems it will be necessary, not only to read the Introduction, but to refer to it continually. The authors confess that in this arrangement they have aimed to abolish the
idea, prevalent in the student mind, that an "Introduction," like a "Preface," is something that no one ever reads. The plan also shortens the statement of a problem, relieving it of much reiterated information.

A few words should be said concerning the use of the calculus notation. As the tendency of writers of elementary works in Physics seems to be towards a greater use of the language of the calculus, it is only appropriate that a fair number of problems should be inserted here which cannot be satisfactorily worked by other than calculus methods. Their number, however, is not large, and the usefulness of the book to students not prepared for them will be in no wise diminished. It is believed that the number of problems is sufficiently large to enable the instructor to make an adequate selection for any class.

Occasional questions not requiring numerical answers have been asked. These are purposely few in number, and are put in to indicate the general character of class-room and examination questions, and with no thought of encroaching upon the province of the instructor.

Here and there graphic methods have been suggested which may be profitably extended by the student. On the other hand, solutions and hints have been omitted in many cases where the student might perhaps expect to find them. It is felt that the methods preferred by the instructor in charge or suggested by the text in use should be used rather than those of the writers, since the general character of the course and the degree of the student's advancement may be thus considered.

It is not expected that the student should work the problems without suggestion, and inability to do so in particular cases may indicate to both student and instructor just where some law or definition is not clearly understood. There are undoubtedly obscurities in the text and errors in answers, and the
authors would esteem it a favor if readers would call attention to them.

Some criticism may be incurred because of the use of mixed units. Many of the students who will use these problems are pursuing engineering courses. In such case they must of necessity use engineering units. The aim has been not so much to train them in the use of these units,—an abundance of this training comes to them during their course,—but to bring out the relation of the so-called "practical" and gravitational units to the C.G.S. units of Physics.

Suggestions have been received from many sources, among others the works of Jones, Jessop, and Everett. The authors' thanks are due to Messrs C. D. Child, C. E. Timmerman, and O. M. Stewart, Instructors in Physics at Cornell University, for solutions of problems and many valued suggestions.

December, 1896.
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