THE ELEMENTS OF LABORATORY WORK: A COURSE OF NATURAL SCIENCE

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LABORATORY WORK

LOWER DIVISION

THE ELEMENTS

OF

LABORATORY WORK

A COURSE OF NATURAL SCIENCE

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PREFACE

THE course of work described in the following pages forms an introduction to all branches of Natural Science. The elementary nature of the book has caused me to pay more attention to method than to detail. Every student will need to follow closely and thoughtfully the performance of each experiment, in nearly all cases making his own observations and measurements, in order that the capacity for independent judgment, as well as an interest in original research, may be awakened at the outset. When a fact or law, discovered by means of a student's own personal observation and intelligence, turns out to be very familiar to others more advanced, the value of the research to the student himself is but slightly impaired.

Each section conveys a definite lesson, and care has been taken that they may follow in inductive sequence. It is important that each experiment and each stage of the course be described and reviewed at length in the student's note-book, which should contain many practical details omitted from the text-book, not only lest they should obscure the more important outlines of work, but also because it is intended that some freedom and originality in manipulation should be encouraged. The trials and practical difficulties of the laboratory are too valuable educationally to be set aside by over-help, though it is essential that they should not be too

severe. It may be noticed that while tables are added to show the results of accurate observers, and to give information as to relative magnitudes, the numerical values resulting from the selected experiments have been generally left to be worked out by the students themselves from their own observations. The word *speed* has been used to denote the rate of motion of a particle along its path, in preference to the term *velocity*, which is now generally reserved to designate a quantity having both magnitude and direction, *i.e.* a vector. The sections numbered 3, 7, 12, 13, 14, 15, 24, 25, and 26, together with many of the additional exercises, may be omitted by beginners.

Rooms devoted to practical science, and well equipped, are nowadays considered a necessary part of all public schools and colleges, and this book is simply intended to be used as a handbook in such laboratories. An effort has been made to arrange a practical and progressive course which shall touch upon the chief problems, and point out the main lines of investigation in Natural Science, in preference to an attempt at explaining any one branch in detail. It is also hoped that the course may give some training in that habit of directly appealing to nature, rather than to theories, which is the root of all scientific progress, although unfortunately it is not always made the basis of scientific education, partly from want of time and partly from want of appliances.

A. G. EARL.

TONBRIDGE: 1890.

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