

## INTRODUCTION

Solving problems in course work is an exercise of the mental faculties, and examination problems are usually chosen from, or set similar to, such problems. Working out problems is thus an essential and important aspect of the study of physics

The series on Problems and Solutions in Physics comprises seven volumes and is the result of months of work of a number of Chinese physicists. The subjects of the volumes and the respective coordinators are as follows:

1. *Mechanics* (Qiang Yuan-qi, Gu En-pu, Cheng Jia-fu, Li Ze-hua, Yang De-tian)
2. *Electromagnetism* (Zhao Sh-ping, You Jun-han, Zhu Jun-jie)
3. *Optics* (Bai Gui-ru, Guo Guang-can)
4. *Atomic, Nuclear and Particle Physics* (Jin Huai-cheng, Yang Bao-zhong, Fan Yang-mei)
5. *Thermodynamics and Statistical Physics* (Zheng Jiu-ren)
6. *Quantum Mechanics* (Zhang Yong-de, Zhu Dong-pei, Fan Hong-yi)
7. *Solid State Physics and Miscellaneous Topics* (Zhang Jia-lu, Zhou You-yuan, Zhang Shi-ling)

These volumes, which cover almost all aspects of university physics, contain some 2550 problems solved in detail.

The problems have been carefully chosen from a total of 3100 problems collected from the China-U.S.A. Physics Examination and Application Programme, the Ph.D. Qualifying Examination on Experimental High Energy Physics sponsored by Chao-chong Ting, and the graduate qualifying examinations of seven world-renowned American universities: Columbia University, the University of California at Berkeley, Massachusetts Institute of Technology, the University of Wisconsin, the University of Chicago, Princeton University, and the State University of New York at Buffalo.

Generally speaking, examination problems in physics in American universities do not require too much mathematics. They can be characterized

to a large extent as follows. Many problems are concerned with the various frontier subjects and overlapping domains of topics, having been selected from the setters' own research encounters. These problems show a "modern" flavor. Some problems involve a wide field and require a sharp mind for their analysis, while others require simple and practical methods demanding a fine "touch of physics." We believe that these problems, as a whole, reflect to some extent the characteristics of American science and culture, as well as give a glimpse of the philosophy underlying American education.

That being so, we consider it worthwhile to collect and solve these problems and introduce them to physics students and teachers everywhere, even though the work is both tedious and strenuous. About a hundred teachers and graduate students took part in this time-consuming task.

This volume on Mechanics which contains 410 problems is divided into three parts: Part I consists of 272 problems on Newtonian Mechanics; Part II, 84 problems on Analytical Mechanics; Part III, 54 problems on Special Relativity.

A small fraction of the problems is of the nature of mechanics as in general physics, while the majority properly belongs to theoretical mechanics, with some on relativity. A wide range of knowledge is required for solving some of the problems which demand a good understanding of electromagnetism, optics, particle physics, mathematical physics, etc. We consider such problems particularly beneficial to the student as they show the interrelationship of different areas of physics which one is likely to encounter in later life. Twenty seven physicists contributed to this volume, notably Ma Qian-cheng, Deng You-ping, Yang Zhong-xia, Ji Shu, Yang De-tian, Wang Ping, Li Xiao-ping, Qiang Yuan-qi, Chen Wei-zu, Hou Bi-hui, and Chao Ze-xian.

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