<<医用物理学实验>>

图书基本信息

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内容概要

The book is written primarily for the first year of pre-medical students. We provide a systematic but brief introduction to the knowledge of measurement data analysis, which includes uncertainty estimation, significant figures and scientific notation. The emphasis of this book is on the training of basic measurements, such as the measurements of length, speed, temperature and voltage, and experimental skills, such as correct recording of data, focusing of a telescope, operation of an oscilloscope, circuit connection, finding the relation between two sets of data, and so on Although most details necessary on the procedures of the experiments are given, this book can not be used as a substitute for carrying out actual experiments.Besides, it is encouraged that students conduct experiments by themselves and carry out data analysis independently, even if, in some cases, cooperation is required The best way to learn from experimental physics is to do it, instead of watching it as a stander-by.

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章节摘录

 插图： Sampling method--the measurements you make must be properly repre-sentative of the quantity you are trying to assess. If you were to find the di-ameter of a steel wire, you should not measure it at one position and orien-tation. If you are going to take samples from a production line for measure-ment, do not always take the first ten made on Wednesday afternoon. The environment--temperature, air pressure, humidity and many otherconditions might also affect the measuring instrument or the item beingmeasured. Whenever the size and effect of an error are known (e. g. from a cali-bration certificate), a correction should be applied to the measurement re-sult. However, in general, uncertainties from each of these sources, andfrom other sources, would be individual 'inputs' contributing to the overalluncertainty in the measurement. Based on the characteristics and the processing method, errors associ-ated the above mentioned sources of uncertainty can be classified into twocategories: systematic error and random error. Systematic error refers tothose caused by factors that affect the result in the same way for each of therepeated measurements (but you may not be able to tell). For example, er-rors associated with the measuring instrument and imported uncertaintymainly belong to this category. Systematic error can not be reduced by in-creasing the number of repeated measurements. In contrast, random errors are the those that take on random valueswhen repeating the measurement, and the uncertainty due to random errors canbe reduced by increasing the number of repetition of the measurement. Further-more, random errors generally tend to distribute in the same way, i. e. , theyusually obey normal or Gaussian distribution. You might see this type of distri-bution if you examine the heights of individuals in a large group of men.Most men are close to average height ：few are extremely tall or short. A sketch of normal distribution is shown in Fig. 0. 2. Under normaldistribution, errors with small magnitude occur more frequently than thosewith large magnitude. In addition, the positive errors and negative errorsare symmetrically distributed about the center, where error is zero.

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