

Preface

The comprehension and assimilation of some main questions and concepts of physical chemistry create certain difficulties for students. The nature of entropy and thermodynamic potentials, the meaning of thermal effect, the analogy and difference between heat exchange and work belong to the problems of this kind.

Our long-term practice indicates the complexity of perception of these questions by traditional methods. Superficial knowledge causes the loss of interest regarding to the subject. The goal of proposed work was the creation of the clear view in students about the basic topics of chemical thermodynamics. For achievement of this purpose we did not avoid the use of nontraditional methods of exposition. This results in the original structure of this book. Each chapter includes more or less extended theoretical part and problems with solutions. The essential minimum of the actual knowledge is given in the theoretical part. This minimum is explained by using the methods and views, which facilitate the thorough understanding of the topic e.g. entropy is interpreted by using of statistical thermodynamics, which is more clear then classical approach. The change of entropy of surroundings and “universe”, the “noncompensated” heat of Clausius, the entropy production, the “lost” work are considered with the same purpose. The existence of internal connection between thermodynamic potentials and production of entropy is shown. The method of generalized forces is utilized e.g. in order to establish the analogy between heat exchange and work.

To overcome the loading of the material, some questions are not introduced in the theoretical part, but are discussed in the problems e.g. the difference between heat exchange and work, relation between heat exchange and entropy, which are explained by means of variations of the population and heights of energy levels of the system. In problems of the “Great fluctuations” is shown, that the second law of thermodynamics possesses not absolute but statistical character. There is shown also that the probability of

the spontaneous proceeding of the unnatural process is practically equal to zero; period, which is required for its realization is incomparably large with the existence time of the universe. The ideality and unideality of a gas is associated with classical and quantum modes of the process proceeding.

Some problems are discussed in view of both cognitive and historical intention e.g. discussion between Boltzman and his opponents, Gibbs's paradox etc.

The relation between the integrating constant of entropy and expressions of statistical thermodynamics is deduced in problems devoted to Gibbs' paradox. It is shown that Gibbs's paradox is stipulated by neglecting of concentration in the classical expression of entropy. The expressions of chemical constants and their numerical values are determined from Sacure-Tetrode' formulae, which were deduced early by using of statistical and quantum views.

We tried to establish the connections between different chapters e.g. the expansion processes are considered by using both the first and second laws of thermodynamics. The alteration of thermodynamic potential is discussed in connection with changes in entropy of system, surroundings and "universe".

The questions of practical importance are also considered in the proposed book, viz. the principles of working and peculiarities of automobile, refrigerator, air conditioner and heat pump (reversed air conditioner).

Problems are solved scrupulously. They are accompanied by remarks, commentaries and explanations of different character. The conclusions are given at the close of the tables (which combines the results of several problems). This promotes to comprehension the basic meaning of problems and to interpret the material on the whole.

The SI units are mainly used in the proposed book. However, sometimes the CGSM and nonsystemic units are utilized e.g. calorie, atmosphere, liter.

We think because of the abovementioned novelties the book will not be insured from the deficiencies. The authors will receive the critical remarks with gratitude.

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