

Book Review

Thermal Physics, Second edition

by **C. B. P. Finn,**

Chapman and Hall, London-Glasgow-New York-Tokyo-Melbourne-Madras, 1993

Physics and its Applications series, Volume 5, 256 pages

Price: £13.95

The author, dr. Colin Finn, Reader in Physics at the University of Sussex, Brighton, U.K., has written Thermal Physics as physicist. The book is well written and organized, reflecting Dr. Colin's teaching experience in the subject. For much of the book, the information is clearly presented with excellent figures.

In this book the author laid great emphasis on understanding the basic ideas and fundamental relations of the science of thermodynamics.

Thermal Physics consists of 11 chapters and 6 appendices.

In the Introduction the importance of thermodynamics is outlined.

In the 1st chapter we meet the concept of temperature, scales of temperature such as the gas scale, the Celsius scale and the International Temperature Scale of 1990. Also, some basic concepts have been defined in this chapter: thermodynamic system, surroundings, state variables, thermal equilibrium, the seroth law of thermodynamics, isotherms, equations of state.

In the 2nd chapter the reader can find a description of reversible processes and several kinds of work, which are at the heart of equilibrium thermodynamics.

The following two chapters have been devoted to the first and second law of thermodynamics. Several essential definitions and functions can also be found in this section: internal energy (U), heat (Q), heat capacity (C), ideal and non-ideal gases. He considered two types of flow processes, the turbine and the flow through a nozzle, as well as the Joule-Kelvin effect, Carnot cycles and the efficiencies of ideal and real engines.

The whole 5th chapter has been occupied by entropy, particularly by the Clausius inequality, the principle of increasing entropy, the central equation of thermodynamics, the microscopic viewpoint of entropy.

In the 6th chapter important thermodynamic potentials, such as internal energy, enthalpy, Helmholtz function (free energy), Gibbs potential and the Maxwell relations can be found.

Some general thermodynamic relations have been summarized in the 7th chapter. These are: the difference and the ratio of heat capacities ($C_p - C_v$, C_p/C_v), the entropy of an ideal gas, Joule coefficient for free expansion and throttling process. In the 8th chapter the applicability of the methods of thermodynamics for four systems (magnetic systems, thermal radiation in cavity, rubber bands, reversible electroic cell) has been shown.

The 9th chapter contains basic information about phase changes: PVT surfaces, Clausius–Clapeyron equation, examples of phase changes of different orders.

The 10th chapter is a kind of introduction to the concept of chemical potential and its application. The author has chosen three types of application, one from the field of biology (osmotic pressure), another from solid state physics (Fermi level) and the third from chemistry (chemical equilibrium) to illustrate the use of chemical potential.

The last chapter deals with the 3rd law of thermodynamics and some consequences of it.

Content of Appendices

Appendix A: values of physical constants and conversion factors.

Appendix B: some mathematical relations used in thermodynamics.

Appendix C: the work required to magnetize a magnetic material and to polarize a dielectric.

Appendix D: questions (it is an extensive section of carefully selected exercises).

Appendix E: answers to questions.

Appendix F: further readings.

The closing part of the book is a subject index.

Thermal Physics has been written in the classical language of reversible thermodynamics using large-scale bulk properties of a system which are measurable, such as volume, temperature, pressure, specific heat. The text is clearly illustrated and contains examples of the application of thermodynamics to physics, engineering and partly to chemistry.

It can be useful as a textbook for students of physics, engineering and chemistry both at undergraduate and postgraduate levels.

It could also be valuable for those engaged in research, who require a rapid summary of scientific thermal physics in their work.

Dr. László Beda
Associated Prof.
Ybl Miklós Polytech.
Dept. of Fire Prot. Eng.