

# Physics Notes Class 11 CHAPTER 12

## THERMODYNAMICS

The branch dealing with measurement of temperature is called thermometry and the devices used to measure temperature are called thermometers.

### Heat

Heat is a form of energy called thermal energy which flows from a higher temperature body to a lower temperature body when they are placed in contact.

Heat or thermal energy of a body is the sum of kinetic energies of all its constituent particles, on account of translational, vibrational and rotational motion.

The SI unit of heat energy is joule (J).

The practical unit of heat energy is calorie.

$$1 \text{ cal} = 4.18 \text{ J}$$

1 calorie is the quantity of heat required to raise the temperature of 1 g of water by 1°C.

Mechanical energy or work (W) can be converted into heat (Q) by  $1 \text{ W} = JQ$

where  $J$  = Joule's mechanical equivalent of heat.

$J$  is a conversion factor (not a physical quantity) and its value is 4.186 J/cal.

### Temperature

Temperature of a body is the degree of hotness or coldness of the body. A device which is used to measure the temperature, is called a thermometer.

Highest possible temperature achieved in laboratory is about 10<sup>8</sup> while lowest possible temperature attained is 10<sup>-8</sup> K.

Branch of Physics dealing with production and measurement temperature close to 0 K is known as cryogenics, while that dealing with the measurement of very high temperature is called pyrometry. Temperature of the core of the sun is 10<sup>7</sup> K while that of its surface 6000 K.

NTP or STP implies 273.15 K (0°C = 32°F).

### Different Scale of Temperature

# Physics Notes Class 11 Chapter 12 Thermodynamics

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## **Physics Notes Class 11 Chapter 12 Thermodynamics:**

**Kelvin, Thermodynamics and the Natural World** M.W. Collins, R.C. Dougal, C. Koenig, I. Ruddock, Strathclyde University, UK, 2015-12-14 This volume looks afresh at the life and works of Lord Kelvin including his standing and relationships with Charles Darwin, T. S. Huxley and the X club thereby throwing new light on the nineteenth century conflict between the British energy and biology specialists. It focuses on two principal issues. Firstly, there is the contribution made by Kelvin to the formulation of the Laws of Thermodynamics, both personal and in the content of the scientific communications exchanged with other workers such as Joule and Clausius. Secondly, there is Kelvin's impact on the wider field of science such as thermoelectricity and geology, determination of the age of the earth. Of late a number of studies and initiatives including the Centenary celebrations of Kelvin's death and exhibits such as that of the Revolutionary Scientist in the Hunterian Museum Glasgow have been undertaken, aiding the redefinition of Kelvin's greatness and achievements. The book also raises awareness to improve our approach to the teaching of elementary thermodynamics by attempting to empathise with Kelvin's perspective. It is completed by a full biography, overviews of various monuments to his memory and short Stories in Pictures on the Atlantic cable, Maxwell's Demon, the universities associated with the development of thermodynamics and the Royal Society of Edinburgh. Scientists and engineers with an interest in thermodynamics and anyone interested in the work of Lord Kelvin will find benefit in *Kelvin, Thermodynamics and the Natural World*. **Physics** Peter Lindenfeld, Suzanne White Brahmia, 2011 Today's physics textbooks have become encyclopedic, offering students dry discussions, rote formulas and exercises with little relation to the real world. *Physics: The First Science* takes a different approach by offering uniquely accessible, student-friendly explanations, historical and philosophical perspectives, and mathematics in an easy-to-comprehend dialogue. It emphasizes the unity of physics and its place as the basis for all science. Examples and worked solutions are scattered throughout the narrative to help increase understanding. Students are tested and challenged at the end of each chapter with questions ranging from a guided review designed to mirror the examples to problems, reasoning, skill-building exercises that encourage students to analyze unfamiliar situations and interactive simulations developed at the University of Colorado. With their experience instructing both students and teachers of physics for decades, Peter Lindenfeld and Suzanne White Brahmia have developed an algebra-based physics book with features to help readers see the physics in their lives. Students will welcome the engaging style, condensed format, and economical price. **Chemical Thermodynamics** Victor CM Freestone, 2025-06-13 Thermodynamics can never be made easy, but with the right approach and a consistent use of scientific terms, it can be made less opaque and it can give a person who is prepared to try an insight into how science explains why things happen the way they do. The approach adopted in this book will give readers a better understanding of how science works together with its limitations. Unfortunately, thermodynamics, or at least some parts of it, is a subject which, apart from quantum mechanics, probably causes most confusion and bewilderment amongst scientists. The majority of

students do not understand or get thermodynamics and it is considered a hard or difficult subject There are multiple reasons for this There is of course mathematics and many thermodynamic texts appear to be lists upon lists of differential equations Another reason is that thermodynamics is as often as not poorly taught by teachers lecturers who themselves do not understand or appreciate or have any interest in the subject often all three This results not only in a lack of scientific rigorousness in the teaching of the subject with the resulting confusion and sometimes teachers lecturers and authors just get it plain wrong this occurs surprisingly often However it need not be like this and although mathematics including calculus is required it can be kept to a relatively elementary level in order to obtain an understanding of this most important of subjects No one can pretend that the subject is easy but it can be made more accessible by a rigorous definition of terms and concepts and ensuring that a consistency of use of these definitions is maintained Highlighting the benefits of thermodynamics in practical science the text gives an intuitive grasp of the major concepts of thermodynamics such as energy and entropy Provides a new pedagogic approach to understanding and teaching chemical thermodynamics Starting with a set of basic simple assumptions about what constitutes topics such as an ideal gas theories are developed in a clear concise and accessible manner that will either answer or at the very least give an insight into a surprising range of scientific phenomena including energy heat temperature properties of gases time and quantum theory Assumes that the reader has essentially no knowledge of the subject Mathematics including calculus is kept to a relatively elementary level in order to obtain an understanding of this most important of subjects Provides the reader with a better understanding of how science works together with its limitations

**Physics Briefs**, 1990 *Universal Themes of Bose-Einstein Condensation* Nick P. Proukakis, David W. Snoke, Peter B. Littlewood, 2017-04-27 Following an explosion of research on Bose Einstein condensation BEC ignited by demonstration of the effect by 2001 Nobel prize winners Cornell Wieman and Ketterle this book surveys the field of BEC studies Written by experts in the field it focuses on Bose Einstein condensation as a universal phenomenon covering topics such as cold atoms magnetic and optical condensates in solids liquid helium and field theory Summarising general theoretical concepts and the research to date including novel experimental realisations in previously inaccessible systems and their theoretical interpretation it is an excellent resource for researchers and students in theoretical and experimental physics who wish to learn of the general themes of BEC in different subfields

Cellular Automata And Complexity Stephen Wolfram, 2018-03-08 Are mathematical equations the best way to model nature For many years it had been assumed that they were But in the early 1980s Stephen Wolfram made the radical proposal that one should instead build models that are based directly on simple computer programs Wolfram made a detailed study of a class of such models known as cellular automata and discovered a remarkable fact that even when the underlying rules are very simple the behaviour they produce can be highly complex and can mimic many features of what we see in nature And based on this result Wolfram began a program of research to develop what he called A Science of Complexity The results of Wolfram s

work found many applications from the so called Wolfram Classification central to fields such as artificial life to new ideas about cryptography and fluid dynamics This book is a collection of Wolfram s original papers on cellular automata and complexity Some of these papers are widely known in the scientific community others have never been published before Together the papers provide a highly readable account of what has become a major new field of science with important implications for physics biology economics computer science and many other areas

**Open-Ended Problems** James Patrick Abulencia, Louis Theodore, 2015-03-27 This is a unique book with nearly 1000 problems and 50 case studies on open ended problems in every key topic in chemical engineering that helps to better prepare chemical engineers for the future The term open ended problem basically describes an approach to the solution of a problem and or situation for which there is not a unique solution The Introduction to the general subject of open ended problems is followed by 22 chapters each of which addresses a traditional chemical engineering or chemical engineering related topic Each of these chapters contain a brief overview of the subject matter of concern e g thermodynamics which is followed by sample open ended problems that have been solved by the authors employing one of the many possible approaches to the solutions This is then followed by approximately 40 45 open ended problems with no solutions although many of the authors solutions are available for those who adopt the book for classroom or training purposes A reference section is included with the chapter s contents Term projects comprised of 12 additional chapter topics complement the presentation This book provides academic industrial and research personnel with the material that covers the principles and applications of open ended chemical engineering problems in a thorough and clear manner Upon completion of the text the reader should have acquired not only a working knowledge of the principles of chemical engineering but also and more importantly experience in solving open ended problems What many educators have learned is that the applications and implications of open ended problems are not only changing professions but also are moving so fast that many have not yet grasped their tremendous impact The book drives home that the open ended approach will revolutionize the way chemical engineers will need to operate in the future

**The Scientific Letters and Papers of James Clerk Maxwell: Volume 3, 1874-1879** James Clerk Maxwell, 1990 This is a comprehensive edition of Maxwell s manuscript papers published virtually complete and largely for the first time

**Applied Mechanics Reviews** ,1993 B.H. Blackwell B.H. Blackwell Ltd, 1928 *Chemica Scripta* ,1973  
*Mathematical Reviews* ,2008 English Mechanic and Mirror of Science and Art ,1919 Chemical Engineering Education ,1985 **Chemical Engineering Catalog** ,1921 Scientific American ,1901 Bulletin of the Institution of Engineers (India). Institution of Engineers (India), 1965 *Dictionary Catalog of the Research Libraries of the New York Public Library, 1911-1971* New York Public Library. Research Libraries, 1979 **Monthly Weather Review** ,1899  
**Society Records** American Society of Mechanical Engineers, 1962

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