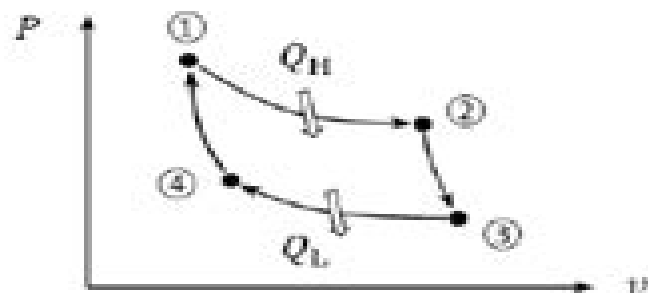


## Written Problem

The Carnot cycle is an idealization that involves four processes as shown (see also Figure 6–37 in textbook). As each of the processes is reversible, the entire cycle is also reversible.



- ① → ② : Isothermal expansion at  $T = T_H$
- ② → ③ : Adiabatic expansion (no heat transfer)
- ③ → ④ : Isothermal compression at  $T = T_L$
- ④ → ① : Adiabatic compression (no heat transfer)

- (a) Suppose the Carnot cycle is carried out in a closed system with an ideal gas as working fluid. Show that

$$Q_H = mRT_H \ln(V_2/V_1)$$

where  $m$  is the mass of the ideal gas. (Recall that the internal energy of an ideal gas depends *only* on the temperature  $T$ .)

You are now provided with more specifics: The ideal gas is 2 g of air. The Carnot cycle operates between  $T_H = 500$  K and  $T_L = 300$  K, with  $V_2 = 2V_1$ .

- (b) What is the amount of heat  $Q_L$  (kJ) that is transferred to the cold reservoir in every cycle?
- (c) Determine  $W_{\text{net}}$  (kJ), the net amount of work that is produced per cycle.

Note that  $W_{\text{net}}$  can be obtained by summing the  $\int P \, dV$  contribution from each of the four processes. This approach, however, is not recommended as there are much easier ways to get to the answer.

# Carnot Cycle Problems And Solutions

**Lloyd M. Polentz**



## **Carnot Cycle Problems And Solutions:**

**Problems and Solutions in Thermal Engineering** Shiv Kumar, 2023-07-15 This book is a collection of over 225 multiple choice type questions MCQs and more than 40 practice exam questions with solutions This book complements a 2 volume textbook set titled Thermal Engineering by the same author The answers are adequately supported by well illustrated diagrams wherever necessary for better understanding of the concepts The book also included steam tables as an appendix to aid in problem solving This book proves useful for undergraduate students of mechanical engineering and related disciplines The book is used in conjunction with the author's textbook set on thermal engineering or as a supplement to other core textbooks and lecture materials It is used to support classroom teaching or as a self study guide The problem solution format also proves useful for students and professionals involved in exam prep for graduate university entrance tests and professional certifications

**Problems in Chemical Thermodynamics with Solutions** Maka Aleksishvili, Shota Sidamonidze, 2002 The methods of chemical thermodynamics are effectively used in many fields of science and technology Mastering these methods and their use in practice requires profound comprehension of the theoretical questions and acquisition of certain calculating skills This book is useful to undergraduate and graduate students in chemistry as well as chemical thermal and refrigerating technology it will also benefit specialists in all other fields who are interested in using these powerful methods in their practical activities

Problems and Solutions William Shepherd, D. W. Shepherd, 2008 A natural complement to the book Energy Studies by the same authors this book contains solutions to 370 existing and new problems many with illustrations and updated Tables of Data on fuel supply This book is also available as a set with Energy Studies Energy Studies considers the various options of renewable energy including water energy wind energy and biomass solar thermal and solar photovoltaic energy And should the nuclear option remain open The book examines the environmental implications and economic viability of all fossil and renewable sources introduces more distant future options of geothermal energy and nuclear fusion and discusses a near future energy strategy

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The intention

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Introduction To Statistical Mechanics: Solutions To Problems John Dirk Walecka,2016-08-25 Statistical mechanics is concerned with defining the thermodynamic properties of a macroscopic sample in terms of the properties of the microscopic systems of which it is composed The previous book Introduction to Statistical Mechanics provided a clear logical and self contained treatment of equilibrium statistical mechanics starting from Boltzmann s two statistical assumptions and presented a wide variety of applications to diverse physical assemblies An appendix provided an introduction to non equilibrium statistical mechanics through the Boltzmann equation and its extensions The coverage in that book was enhanced and extended through the inclusion of many accessible problems The current book provides solutions to those problems These texts assume only introductory courses in classical and quantum mechanics as well as familiarity with multi variable calculus and the essentials of complex analysis Some knowledge of thermodynamics is also assumed although the analysis starts with an appropriate review of that topic The targeted audience is first year graduate students and advanced undergraduates in physics chemistry and the related physical sciences The goal of these texts is to help the reader obtain a clear working knowledge of the very useful and powerful methods of equilibrium statistical mechanics and to enhance the understanding and appreciation of the more advanced texts

**An Introduction to Thermodynamics, for Engineering Students** John Mills,1910 HVACR Principles and Applications Nuggenhalli S. Nandagopal,2024-03-07 This book provides a clear and concise understanding of the principles and applications of HVACR using a rigorous yet easy to follow presentation The coverage is broad including relevant support areas such as fluid mechanics heat transfer thermodynamics psychrometrics with specific applications to HVACR design and calculations and main topics such as air conditioning processes cooling heating load calculations refrigeration cycles and HVACR equipment and systems The book integrates and illustrates the use of data and information from ASHRAE Handbooks and Standards in step by step calculations of cooling and heating loads and other aspects of HVACR Elucidation of the principles is further reinforced by examples and practice problems with detailed solutions Firmly grounded in the fundamentals the book maximizes readers capacity to take on new problems and challenges in the field of HVACR with confidence and conviction Providing a ready reference and review of essential principles and their applications in HVACR the book is ideal for HVACR practitioners undergraduate engineering students and those specializing in HVACR as well as for practicing engineers preparing for the engineering license exams FE and PE in USA and abroad The book uses

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