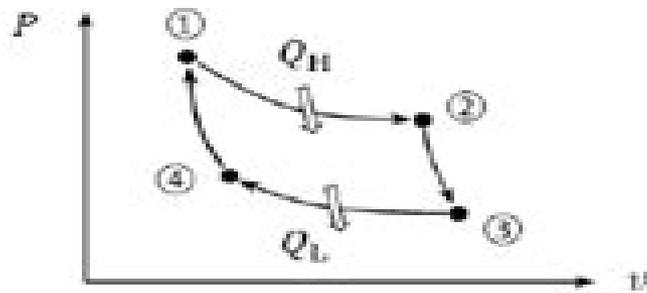


Written Problem

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_{net} (kJ), the net amount of work that is produced per cycle.

Note that W_{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 Numerical Problems With Solutions

Julia Schneider



Carnot Cycle Numerical Problems With Solutions:

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

Basics Of Statistical Physics (Third Edition) Harald J W

Muller-kirsten, 2022-03-16 Statistics links microscopic and macroscopic phenomena and requires for this reason a large number of microscopic elements like atoms The results are values of maximum probability or of averaging This introduction to statistical physics concentrates on the basic principles and attempts to explain these in simple terms supplemented by numerous examples These basic principles include the difference between classical and quantum statistics a priori probabilities as related to degeneracies the vital aspect of indistinguishability as compared with distinguishability in classical physics the differences between conserved and non conserved elements the different ways of counting arrangements in the three statistics Maxwell Boltzmann Fermi Dirac Bose Einstein the difference between maximization of the number of arrangements of elements and averaging in the Darwin Fowler method Significant applications to solids radiation and electrons in metals are treated in separate chapters as well as Bose Einstein condensation In this latest edition apart from a general revision the topic of thermal radiation has been expanded with a new section on black bodies and an additional chapter on black holes Other additions are more examples with applications of statistical mechanics in solid state physics and superconductivity Throughout the presentation the introduction carries almost all details for calculations

An Introduction to Thermodynamics, for Engineering Students John Mills, 1910

Fundamentals of Engineering

Thermodynamics John R. Howell, Richard O. Buckius, 1992

Engineering Physics,

Concepts, Problems, and

Solutions in General Physics Raymond A. Serway, 1975

Atkins' Physical Chemistry 11e Peter Atkins, Julio De

Paula, James Keeler, 2019-09-06 *Atkins Physical Chemistry Molecular Thermodynamics and Kinetics* is designed for use on the

second semester of a quantum first physical chemistry course Based on the hugely popular Atkins Physical Chemistry this volume approaches molecular thermodynamics with the assumption that students will have studied quantum mechanics in their first semester The exceptional quality of previous editions has been built upon to make this new edition of Atkins Physical Chemistry even more closely suited to the needs of both lecturers and students Re organised into discrete topics the text is more flexible to teach from and more readable for students Now in its eleventh edition the text has been enhanced with additional learning features and maths support to demonstrate the absolute centrality of mathematics to physical chemistry Increasing the digestibility of the text in this new approach the reader is brought to a question then the math is used to show how it can be answered and progress made The expanded and redistributed maths support also includes new Chemist s toolkits which provide students with succinct reminders of mathematical concepts and techniques right where they need them Checklists of key concepts at the end of each topic add to the extensive learning support provided throughout the book to reinforce the main take home messages in each section The coupling of the broad coverage of the subject with a structure and use of pedagogy that is even more innovative will ensure Atkins Physical Chemistry remains the textbook of choice for studying physical chemistry

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