

SOLUTIONS
THERMODYNAMICS PRACTICE PROBLEMS FOR NON-TECHNICAL MAJORS

Thermodynamic Properties

1. If an object has a weight of 10 lbf on the moon, what would the same object weigh on Jupiter?

$$g_{\text{Jupiter}} = 75 \frac{\text{ft}}{\text{sec}^2} \quad g_{\text{Moon}} = 5.4 \frac{\text{ft}}{\text{sec}^2} \quad g_c = 32 \frac{\text{lbm-ft}}{\text{lbf-sec}^2}$$

$$|W| = \frac{mg}{g_c} \Rightarrow m = \frac{|W|_{\text{Moon}} g_c}{g_{\text{Moon}}} = \frac{10 \times 32}{5.4} = 59.26 \text{ lbm}$$

$$|W|_{\text{Jupiter}} = \frac{mg_{\text{Jupiter}}}{g_c} = \frac{59.26 \times 75}{32} = \boxed{139 \text{ lbf}}$$

2. An object that weighs 50 lbf on earth is moved to Saturn where its new weight is 105 lbf. What is the acceleration due to gravity on Saturn?

$$g_{\text{Earth}} = 32 \frac{\text{ft}}{\text{sec}^2} \quad g_c = 32 \frac{\text{lbm-ft}}{\text{lbf-sec}^2}$$

$$50 \text{ lbf on earth} \Rightarrow 50 \text{ lbm}$$

$$|W| = \frac{mg}{g_c} \Rightarrow g = \frac{|W| g_c}{m} = \frac{105 \times 32}{50} = \boxed{67.2 \frac{\text{ft}}{\text{sec}^2}}$$

3. Define, using equations, specific volume (v) and density (ρ). What is the mathematical relationship between these two terms?

$$v = \frac{V}{m}, \quad \rho = \frac{m}{V}, \quad v = \frac{1}{\rho} \text{ or } \rho = \frac{1}{v}$$

Temperature and Pressure Measurements

4. (a) Define temperature.
(b) What is the absolute temperature scale corresponding to Fahrenheit?
(c) Convert 100° F to that absolute scale.

(a) Temperature: a measure of molecular activity of a substance.

(b) Rankine

(c) °R = °F + 460 \Rightarrow 100° F converts to 560° R

Thermodynamics Sample Problems With Solutions

Darrell Ebbing



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Chemical Engineering License Problems and Solutions Dilip K. Das, Rajaram K. Prabhudesai, 2003-09-18 This is a review book for people planning to take the PE exam in Chemical Engineering Prepared specifically for the exam used in all 50 states It features 188 new PE problems with detailed step by step solutions The book covers all topics on the exam and includes easy to use tables charts and formulas It is an ideal desk Companion to DAS s Chemical Engineer License Review It includes sixteen chapters and a short PE sample exam as well as complete references and an index Chapters include the following topical areas material and energy balances fluid dynamics heat transfer evaporation distillation absorption leaching liq liq extraction psychrometry and humidification drying filtration thermodynamics chemical kinetics process control mass transfer and plant safety The ideal study guide this book brings all elements of professional problem solving together in one BIG BOOK Ideal desk reference Answers hundreds of the most frequently asked questions The first truly practical no nonsense problems and solution book for the difficult PE exam Full step by step solutions are included

Lectures in Classical Thermodynamics with an Introduction to Statistical Mechanics Daniel Blankschtein, 2021-03-15 This textbook facilitates students ability to apply fundamental principles and concepts in classical thermodynamics to solve challenging problems relevant to industry and everyday life It also introduces the reader to the fundamentals of statistical mechanics including understanding how the microscopic properties of atoms and molecules and their associated intermolecular interactions can be accounted for to calculate various average properties of macroscopic systems The author emphasizes application of the fundamental principles outlined above to the calculation of a variety of thermodynamic properties to the estimation of conversion efficiencies for work production by heat interactions and to the solution of practical thermodynamic problems related to the behavior of non ideal pure fluids and fluid mixtures including phase equilibria and chemical reaction equilibria The book contains detailed solutions to many challenging sample problems in classical thermodynamics and statistical mechanics that will help the reader crystallize the material taught Class tested and perfected over 30 years of use by nine time Best Teaching Award recipient Professor Daniel Blankschtein of the Department of Chemical Engineering at MIT the book is ideal for students of Chemical and Mechanical Engineering Chemistry and Materials Science who will benefit greatly from in depth discussions and pedagogical explanations of key concepts Distills critical concepts methods and applications from leading full length textbooks along with the author s own deep understanding of the material taught into a concise yet rigorous graduate and advanced undergraduate text Enriches the standard curriculum with succinct problem based learning strategies derived from the content of 50 lectures given over the years in the Department of Chemical Engineering at MIT Reinforces concepts covered with detailed solutions to illuminating and challenging homework problems

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Experts, 2021-10-07 The thoroughly revised updated 9th Edition of Go To Objective NEET Chemistry is developed on the

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Table of Contents Thermodynamics Sample Problems With Solutions

1. Understanding the eBook Thermodynamics Sample Problems With Solutions
 - The Rise of Digital Reading Thermodynamics Sample Problems With Solutions
 - Advantages of eBooks Over Traditional Books
2. Identifying Thermodynamics Sample Problems With Solutions
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an eBook Thermodynamics Sample Problems With Solutions
 - User-Friendly Interface
4. Exploring eBook Recommendations from Thermodynamics Sample Problems With Solutions
 - Personalized Recommendations
 - Thermodynamics Sample Problems With Solutions User Reviews and Ratings

- Thermodynamics Sample Problems With Solutions and Bestseller Lists
- 5. Accessing Thermodynamics Sample Problems With Solutions Free and Paid eBooks
 - Thermodynamics Sample Problems With Solutions Public Domain eBooks
 - Thermodynamics Sample Problems With Solutions eBook Subscription Services
 - Thermodynamics Sample Problems With Solutions Budget-Friendly Options
- 6. Navigating Thermodynamics Sample Problems With Solutions eBook Formats
 - ePub, PDF, MOBI, and More
 - Thermodynamics Sample Problems With Solutions Compatibility with Devices
 - Thermodynamics Sample Problems With Solutions Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Thermodynamics Sample Problems With Solutions
 - Highlighting and Note-Taking Thermodynamics Sample Problems With Solutions
 - Interactive Elements Thermodynamics Sample Problems With Solutions
- 8. Staying Engaged with Thermodynamics Sample Problems With Solutions
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Thermodynamics Sample Problems With Solutions
- 9. Balancing eBooks and Physical Books Thermodynamics Sample Problems With Solutions
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Thermodynamics Sample Problems With Solutions
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Thermodynamics Sample Problems With Solutions
 - Setting Reading Goals Thermodynamics Sample Problems With Solutions
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Thermodynamics Sample Problems With Solutions
 - Fact-Checking eBook Content of Thermodynamics Sample Problems With Solutions
 - Distinguishing Credible Sources

13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
14. Embracing eBook Trends
 - Integration of Multimedia Elements
 - Interactive and Gamified eBooks

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