

SOLUTIONS
THEMODYNAMICS 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

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Maka Aleksishvili, Shota Sidamonidze



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Problems And Solutions On Thermodynamics And Statistical Mechanics Yung-kuo Lim, 1990-02-01 The material for these volumes has been selected from the past twenty years examination questions for graduate students at University of California at Berkeley, Columbia University, the University of Chicago, MIT, State University of New York at Buffalo, Princeton University and University of Wisconsin.

Solved Problems in Thermodynamics and Statistical Physics Gregor Skačej, Primož Zihlerl, 2019-11-09 This book contains a modern selection of about 200 solved problems and examples arranged in a didactic way for hands-on experience with course work in a standard advanced undergraduate, first-year graduate class in thermodynamics and statistical physics. The principles of thermodynamics and equilibrium statistical physics are few and simple, but their application often proves more involved than it may seem at first sight. This book is a comprehensive complement to any textbook in the field, emphasizing the analogies between the different systems and paving the way for an in-depth study of solid state physics, soft matter physics and field theory.

Problems And Solutions On Thermodynamics And Statistical Mechanics (Second Edition) Swee Cheng Lim, Choy Heng Lai, Leong-chuan Kwek, 2021-11-18 This volume is a compilation of carefully selected questions at the PhD qualifying exam level, including many actual questions from Columbia University, University of Chicago, MIT, State University of New York at Buffalo, Princeton University, University of Wisconsin and the University of California at Berkeley over a twenty-year period. Topics covered in this book include the laws of thermodynamics, phase changes, Maxwell-Boltzmann statistics and kinetic theory of gases. This latest edition has been updated with more problems and solutions, and the original problems have also been modernized, excluding outdated

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