

**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 ( $\rho$ ). 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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