Indian Institute of Technology Kanpur
ESO 201 A: Thermodynamics
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Tutorial-1

Q. 1-23 C

Is the weight of a system an extensive or intensive property?

Q. 1-25 C

For a system to be in thermodynamic equilibrium, do the temperature and the pressure have to be the same everywhere?

Q. 1-26 C

What is a quasi-equilibrium process? What is its importance in engineering?

Q. 1-31 C

When is a steady-flow process?

Q. 1-53

The water in a tank is pressurized by air, and the pressure is measured by a multi-fluid manometer as shown in Fig. P l-53. Determine the gage pressure of air in the tank if h1= 0.2 m, h2 = 0.3 m, and h3 = 0.46 m. Take the densities of water, oil, and mercury to be 1000 kg/m3, 850 kg/m3, and 13,600 kg/m3, respectively.

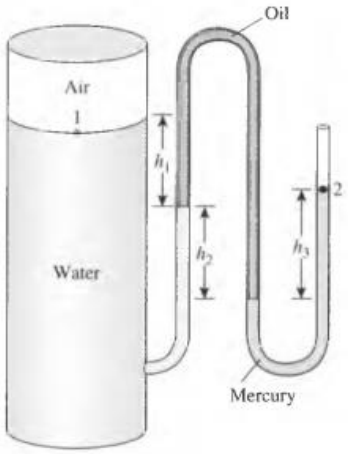

FIGURE P1–53

Q. 1-67

A gas is contained in a vertical, frictionless piston-cylinder device. The piston has a mass of 3.2 kg and a cross-sectional area of 35 cm2. A compressed spring above the piston exerts a force of 150 N on the piston. If the atmospheric pressure is 95 kPa, determine the pressure inside the cylinder.

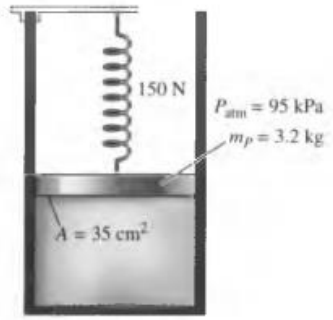

FIGURE P1–67

Additional Homework Problems

Q 1-19C

You have been asked to do a metabolism (energy) analysis of a person. How would you define the system for this purpose? What type of system is this?

Q 1-24 C

The molar specific volume of a system V is defined as the ratio of the volume of the system to the number of moles of substance contained in the system. Is this an extensive or intensive property?

Q 1-27 C

Define the isothermal, isobaric, and isochoric processes.

Q 1-35 C

Consider an alcohol and a mercury thermometer that read exactly 0°C at the ice point and 100°C at the steam point. The distance between the two points is divided into 100 equal parts in both thermometers. Do you think these thermometers will give exactly the same reading at a temperature of, say, 60°C? Explain.