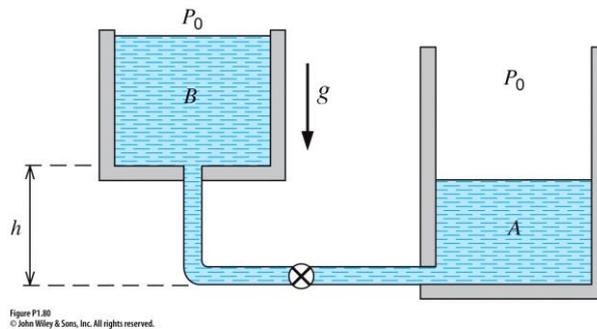


1. A 1 m^3 container is filled with 400 kg of granite stone, 200 kg dry sand and 0.2 m^3 of liquid 25°C water. Use properties from tables A.3 and A.4. Find the average specific volume and density of the masses when you exclude air mass and volume.
2. A vertical hydraulic cylinder has a 125-mm diameter piston with hydraulic fluid inside the cylinder and an ambient pressure of 1 bar. Assuming standard gravity, find the piston mass that will create a pressure inside of 1500 kPa.
3. Two cylinders are filled with liquid water, $\rho = 1000 \text{ kg/m}^3$, and connected by a line with a closed valve, as shown below. A has 100 kg and B has 500 kg of water, their cross-sectional areas are $A_A = 0.1 \text{ m}^2$ and $A_B = 0.25 \text{ m}^2$ and the height h is 1 m. Find the pressure on each side of the valve. The valve is opened and water flows to an equilibrium. Find the final pressure at the valve location.



4. Determine the phase of water at
 - a. 260°C , 5 MPa
 - b. -2°C , 100 kPa
5. Give the missing property of P-v-T and x for water at
 - a. 10 MPa, $0.00104 \text{ m}^3/\text{kg}$
 - b. 1 MPa, 190°C
 - c. 400°C , $0.19 \text{ m}^3/\text{kg}$
 - d. 10 kPa, 10°C
6. A vessel of 0.5 m^3 contains a liquid and a vapor of water of 2 kg in total, which stay in equilibrium at 0.5 MPa. Calculate the volume and the mass of each phase (liquid and vapor).
7. A superheated water vapor is contained in a rigid vessel at 6MPa and 300°C . Now it cools down (1) to the point where the water becomes a saturated vapor and then (2) to 20°C . Calculate T and P of the water at the state (1) and P and x (quality) at the state (2).

8. Water at 600 kPa with a quality of 25% has its pressure raised 50 kPa in a constant volume process. What is the new quality and temperature?

9. Two tanks are connected as shown below, both containing water. Tank A is at 200 kPa, $v = 0.5 \text{ m}^3/\text{kg}$, $V_A = 1 \text{ m}^3$ and tank B contains 3.5 kg at 0.5 MPa, 400°C . The valve is now opened and the two come to a uniform state. Find the final specific volume.

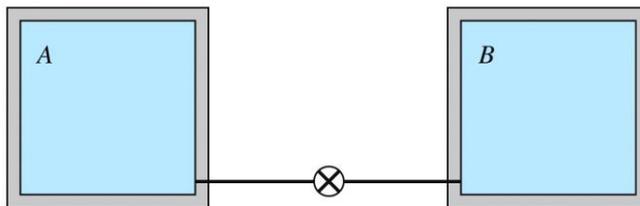


Figure P2.52
© John Wiley & Sons, Inc. All rights reserved.

10. Likewise, a 1 m^3 rigid tank has propane at 125 kPa, 300 K and connected by a valve to another tank of 0.5 m^3 with propane at 250 kPa, 400 K. The valve is opened and the two tanks come to a uniform state at 325 K. What is the final pressure?