Tutorial- 3
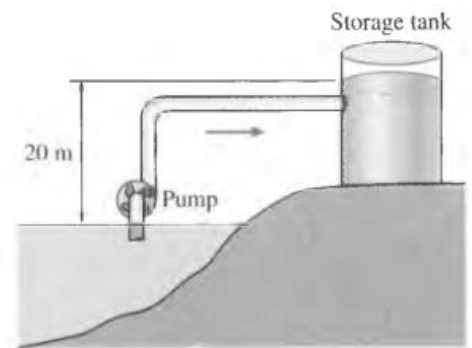
Q 2-71

Water is pumped from a lake to a storage tank 20 m above at a rate of 70 L/s while consuming 20.4 kW of electric power. Disregarding any frictional losses in the pipes and any changes in kinetic energy, determine

(a) The overall efficiency of the pump-motor unit and

(b) The pressure difference between the inlet and the exit of the pump.

FIGURE P2–71

Q 3-14 C

What is the physical significance of h_{fg}? Can it be obtained from a knowledge of h_f and h_g? How?

Q 3-17 C

What is quality? Does it have any meaning in the superheated vapor region?

Q 3-22

Complete this table for H_2O:

| T, °C	P, Kpa	V, m³/kg	Phase description
50		7.72	
	400		Saturated vapor
250	500		
120	5000		

Q 3-44

Water initially at 300 kPa and 250°C is contained in a piston-cylinder device fitted with stops. The water is allowed to cool at constant pressure until it exists as a saturated vapor and the piston rests on the stops. Then the water continues to cool until the pressure is 100 kPa. On the T-v diagrams sketch, with respect to the saturation lines, the process curves passing through both the initial, intermediate, and final states of the water. Label the T, P and v values for end states on the process curves. Find the overall change in internal energy between the initial and final states per unit mass of water.
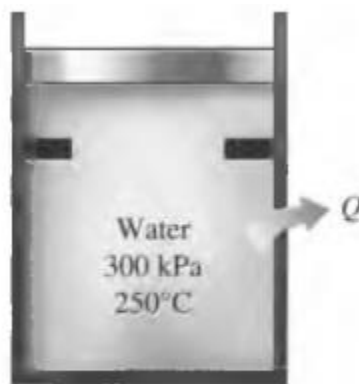
FIGURE P3–44

Additional Homework Problems

Q 3-32

One kilogram of water fills a 150-L rigid container at an initial pressure of 2 MPa. The container is then cooled to 40°C. Determine the initial temperature and the final pressure of the water.
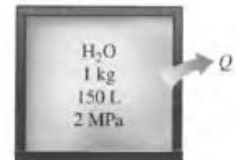
Q3-57

Determine the specific volume, internal energy, and enthalpy of compressed liquid water at 80°C and 20 MPa using the saturated liquid approximation. Compare these values to the ones obtained from the compressed liquid tables.

Q 3-60

A rigid tank contains water vapor at 250°C and an unknown pressure. When the tank is cooled to 124°C, the vapor starts condensing. Estimate the initial pressure in the tank.

Q 3-61

A piston-cylinder device initially contains 1.4-kg saturated liquid water at 200°C. Now heat is transferred to the water until the volume quadruples and the cylinder contains saturated vapor only. Determine (*a*) the volume of the tank, (*b*) the final temperature and pressure, and (*c*) the internal energy change of the water.