

- 4.38 A piston/cylinder assembly contains 1 kg of liquid water at  $20^\circ\text{C}$  and 300 kPa, as shown in Fig. P4.38. There is a linear spring mounted on the piston such that when the water is heated, the pressure reaches 3 MPa with a volume of  $0.1\text{ m}^3$ .
- Find the final temperature.
  - Plot the process in a  $P$ - $v$  diagram.
  - Find the work in the process.

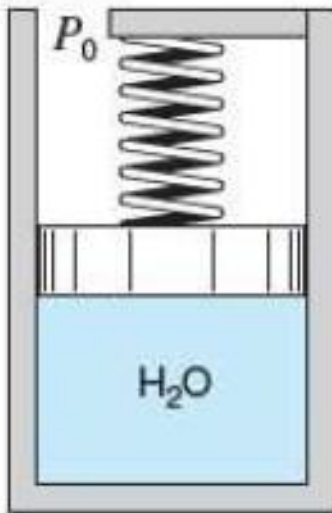


FIGURE P4.38

- 4.72 Ten kilograms of water in a piston/cylinder arrangement exists as saturated liquid/vapor at 100 kPa, with a quality of 50%. It is now heated so that the volume triples. The mass of the piston is such that a cylinder pressure of 200 kPa will float it (see Fig. P4.72).
- Find the final temperature and volume of the water.
  - Find the work given out by the water.

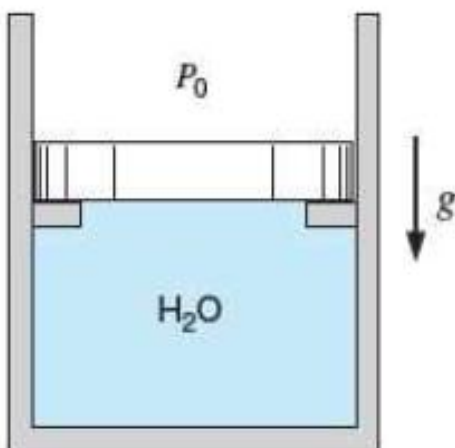


FIGURE P4.72

**4.124** A cylinder fitted with a piston contains propane gas at 100 kPa and 300 K with a volume of  $0.2 \text{ m}^3$ . The gas is now slowly compressed according to the relation  $PV^{1.1} = \text{constant}$  to a final temperature of 340 K. Justify the use of the ideal-gas model. Find the final pressure and the work done during the process.