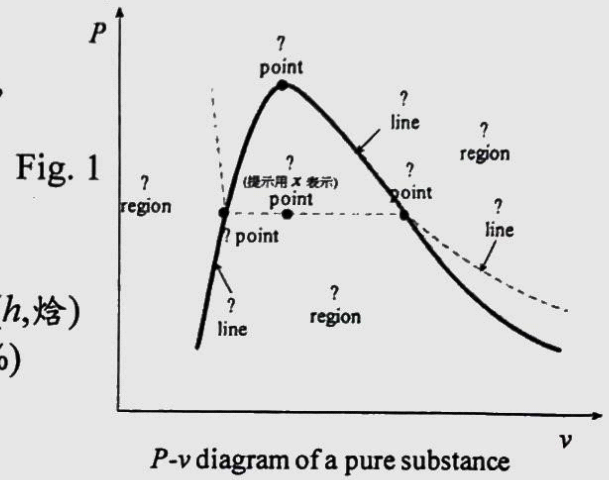
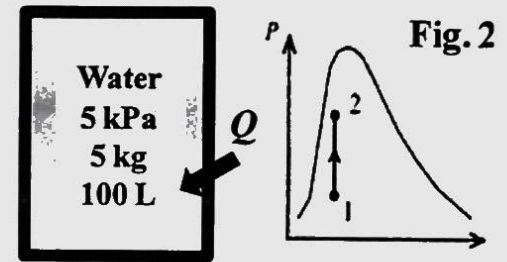


1. Please draw a simple P - v diagram of a pure substance, including each region, line, and point name. (15%)

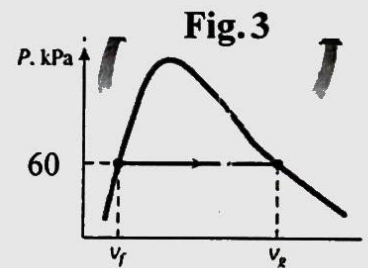


2. Determine the specific volume (v , 比容) and enthalpy (h , 焓) of water at a state of $P = 500$ kPa and $T = 430^\circ\text{C}$. (10%)

3. A 5 kg of water at 5 kPa fills a rigid container whose volume is 100 L (0.1 m^3). Determine the temperature and total enthalpy in the container. The container is now heated until the pressure is 20 kPa. Determine the temperature and total enthalpy when the heating is completed. (As Fig. 2) (20%)

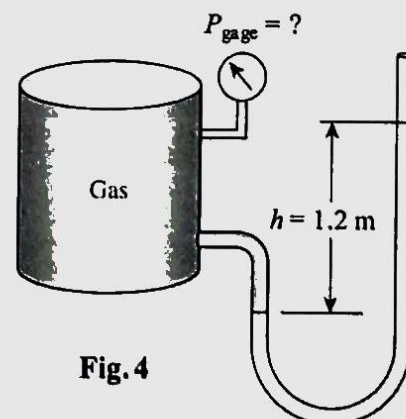


4. As Fig. 3, a mass of 500 g of saturated liquid water is completely vaporized at a constant pressure of 60 kPa. Determine (a) the volume change and (b) the amount of energy transfer of the water. (15%)



5. Determine the specific volume of R-134a at 1.6 MPa and 100°C , using (a) the steam tables (experimental data), (b) the ideal-gas equation, and (c) the generalized compressibility chart. (15%)

6. Both a gage and a manometer are attached to a gas tank to measure its pressure. As Fig. 4, if the $h = 1.2$ m, determine the gage pressure (P_{gage}) between the two fluid levels of the manometer if the fluid is (a) mercury ($\rho = 13600\text{ kg/m}^3$) and (b) oil ($\rho = 860\text{ kg/m}^3$) (10%)



7. As Fig. 5, electric power is to be generated by installing a hydraulic turbine-generator at a site 100 m below the free surface of a large water reservoir that can supply water at a rate of 1000 kg/s steadily. If the mechanical power output of the turbine is 600 kW and the electric power generation is 500 kW, determine the turbine efficiency and the combine turbine-generator efficiency of this plant. (15%)

