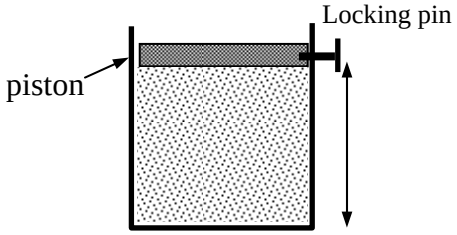
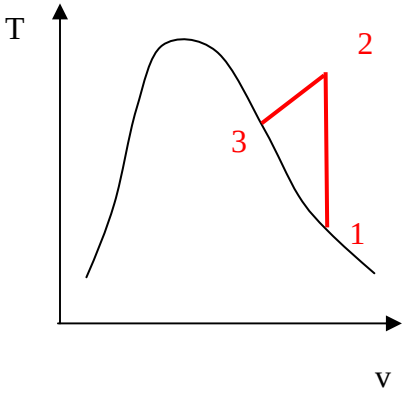
Initially, a closed piston-cylinder contains 1 kg of 100% saturated vapor as shown. The piston is locked at this instant and the pressure of the vapor is measured to be 0.2 MPa.

(a) What is the temperature of the vapor?
(b) What is the volume of the cylinder?
(c) If we heat the cylinder until the vapor pressure reaches to 0.4 MPa, what will be the temperature? (1-2)
(d) We then release the locking pin and cool the superheated vapor back to 100% saturated vapor while maintaining the cylinder at a constant pressure of 0.4 MPa. What is the final volume of the piston & temperature? (2-3)
(e) In part (d) if the temperature is maintained as a constant (say, at 200°C), what is the final volume and the pressure of the cylinder when the superheated vapor cools back to 100% saturated vapor? (still use 0.4 MPa as the initial pressure)
(f) Draw the transition process 1-2-3 on the T-v diagram (not necessarily to scale).





(a) At P = 0.2 MPa, T = 120.23°C

$v = v_{g@P=0.2MPa} = 0.8857\,(m^3/kg)$

(b) $\forall = (1)(0.8857) = 0.8857\,(m^3)$

From table A - 5

(c) Heat vapor with a constant volume $\Rightarrow$ superheated vapor

$v_2 = 0.8857(m^3/kg) = v_1$, from superheated table A - 6, P = 0.4 MPa, $\Rightarrow$ T = 500°C

(d) $P = 0.4MPa$, $v_{g@P=0.4MPa} = 0.4625(m^3/kg)$ from Table A - 5, T = 143.63°C

(e) $T = 200°C, v_{g@T=200°C} = 0.12736(m^3/kg)$ from Table A - 4, P = 1.5538 MPa