Textbook Reading: 3.1-3.8

HW – 8(i)

Complete the following table for propane. You do not need to include system diagram, assumptions, and basic equations for this problem.

State	P, bar	T, °C	v, m³/kg	u, kJ/kg	x	Phase
a		20			1	
b		20	0.033990			
c	1	40				
d	10			158.53		

HW – 8(ii)

A closed, rigid tank with a volume of 1.0 m³ contains 150 kg of saturated liquid-vapor mixture of water at 25ºC.

(a) Find the quality of the mixture.
(b) Determine the mass of liquid and vapor in the mixture, each in kg.
(c) Determine the volume of liquid and vapor in the mixture, each in m³.

HW – 9

A closed, rigid tank of volume 0.25 m³ initially contains R-134a at an absolute pressure of 6 bar and a temperature of 60°C (State 1). The refrigerant is stirred with a paddle wheel and the tank is cooled at the same time. The paddle wheel performs 10 kJ of work on the refrigerant. The refrigerant temperature drops to 12C (State 2) due to the energy interactions.

(a) Determine the final absolute pressure of R-134a in the tank, in bar.
(b) Calculate the heat transfer during the process, in kJ.
(c) Show the process on P-v diagram relative to the vapor dome and the appropriate lines of constant temperature for the two states. Label states and identify process direction with arrows.
For R-134a: $P_{critical}$ = 40.6 bar and $T_{critical}$ = 101°C.

HW – 10

Ammonia (m = 10 kg) contained inside a closed piston-cylinder device undergoes three processes.

Process 1 to 2: A constant pressure process from an absolute pressure of 20 bar and 40°C (State 1) until the volume increases to 0.42174 m³ (State 2)
Process 2 to 3: A constant volume process to saturated vapor (State 3)
Process 3 to 4: A constant temperature process to an absolute pressure of 20 bar (State 4)

(a) Considering the constant temperature process from State 3 to State 4 to be polytropic Pv^n = constant, find the value of n.
(b) Calculate the work for each process, in kJ.
(c) Determine the heat transfer for each process, in kJ.
(d) Show the three processes on T-v diagram relative to the vapor dome and the appropriate lines of constant pressure for the four states. Label states and identify process directions with arrows.
For ammonia: $P_{critical}$ = 113 bar and $T_{critical}$ = 132°C.