Trevor Swan **ECHE225: QUIZ #2 // 9.12.24**

2. Saturated H_2O @ 135 °C, $x = 0.7$. Find v

From Table

$P_{sat} = 313.22$

$v_f = 0.001075 \frac{m^3}{kg}$

$v_g = 0.58179 \frac{m^3}{kg}$

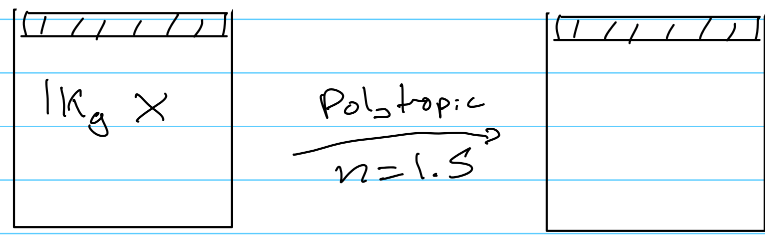
$v = v_f + x(v_g - v_f)$

$= 0.001075 + 0.7(.58179 - .001075)$

$= 0.4075755$

$\boxed{v \approx 0.408}$

3.



$V_1 = 10 m^3$

$P_1 = 6$ kPa

$T_1 =$

$V_2 = 5 m^3$

$P_2 = 16.97$ kPa

$T_2 =$

chemical X

$C_v = 314 \frac{kJ}{kg K}$

$m = 1$ kg

1st Law: $\cancel{Q_{in}}^{\text{adiabatic}} - \cancel{Q_{out}} + W_{in} - \cancel{W_{out}}^{0} = \Delta u$

Adiabatic = no heat transfer

$P_1 V_1^n = P_2 V_2^n$

$P_2 = \frac{P_1 V_1^n}{V_2^n}$

$= \frac{6 \text{ kPa} (10)^{1.5}}{(5)^{1.5}}$

$= 16.97$ kPa

$W_{piston} = \frac{P_2 V_2 - P_1 V_1}{1-n}$

$= \frac{16.97(5) - 6(10)}{1-1.5}$

$= -49.70$ kJ

Define negative as work in!

$W_{in} = 49.70$ kJ

$W_{in} = \Delta u$, $\Delta u = m C_v \Delta T$

$W_{in} = m C_v (\Delta T)$

$49.70 \text{ kJ} = 1 \text{ kg} (314 \frac{kJ}{kg \cdot K})(\Delta T)$

$\rightarrow \Delta T = 15.828$ °K

$T_2 - T_1 = 15.828$ °K

$T_2 - T_2 0.707 = 15.828$ °K

$T_2(1 - 0.707) = 15.828$ °K

$\boxed{T_2 = -218.98}$

$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$

$\frac{P_1 V_1}{P_2 V_2} = \frac{T_1}{T_2}$

$\frac{6 \text{ kPa} (10)}{16.97 (5)} = \frac{T_1}{T_2}$

$0.707 = \frac{T_1}{T_2}$

$T_1 = T_2 0.707$