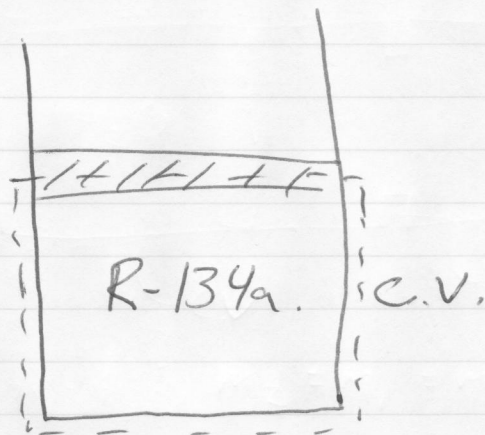


QUIZ 5 (DGD #1)

8.63/



GIVEN:

State 1
 $T_1 = 10^\circ\text{C}$
 $P_1 = 150 \text{ kPa}$
 $V_1 = 20 \text{ L}$

State 2
 $T_2 = T_1$ (Isothermal)
 $x_2 = 1.0$ (sat. vap.)

Process
 Isothermal/
 Reversible

Find: W_{12} , Q_{12} .

Sol'n: Continuity: $m_2 = m_1 = m$.

1st Law: ~~$m(u_2 - u_1)$~~ $m(u_2 - u_1) = Q_{12} - W_{12}$

2nd Law: $m(s_2 - s_1) = \int_1^2 \frac{dQ}{T}$

State 1: from table B.5.2 $\Rightarrow$
 $u_1 = 388.36 \text{ kJ/kg}$
 $s_1 = 1.822 \text{ kJ/kg K}$
 $v_1 = 0.148283 \text{ m}^3/\text{kg}$

mass: $m = \frac{V_1}{v_1} = \frac{0.02 \text{ m}^3}{0.148283} = 0.1349 \text{ kg}$

state 2: from table B.5.1 $\Rightarrow$ $u_2 = 383.67 \text{ kJ/kg}$
 $s_2 = 1.7218 \text{ kJ/kg K}$

heat transfer

$$Q_{12} = \int T ds = mT(s_2 - s_1) = 0.1349(283)(1.72 - 1.82)$$

$$\boxed{Q_{12} = -3.83 \text{ kJ}}$$

work

$$W_{12} = m(u_1 - u_2) + Q_{12} = 0.1349(388 - 384) - 3.83$$

$$\boxed{W_{12} = -3.197 \text{ kJ}}$$