

SOLUTION

NAME: _____

This is an open book quiz. You may use a four function calculator. An unsigned honors pledge will result in a zero.

1. Consider an ideal vapor compression refrigeration cycle. The condenser pressure is 10.0 bar. Saturated vapor enters the compressor, and the compressor exit temperature is 132.865°C. If the working fluid is ammonia, compute the power input to the cycle in units of kJ/kg.

GIVEN: Condenser p ; "g" state entering compressor; compressor exit T ; NH_3 .

FIND: $\dot{W}/\dot{m} = ?$ (Note $\dot{w}_{\text{net}}/\dot{m} = \dot{w}_c/\dot{m}$)

ASSUME: Ideal vapor compression assumptions, namely compressor is isentropic.

ANALYSIS: $\dot{w}_c/\dot{m} = h_2 - h_1$

From NH_3 tables

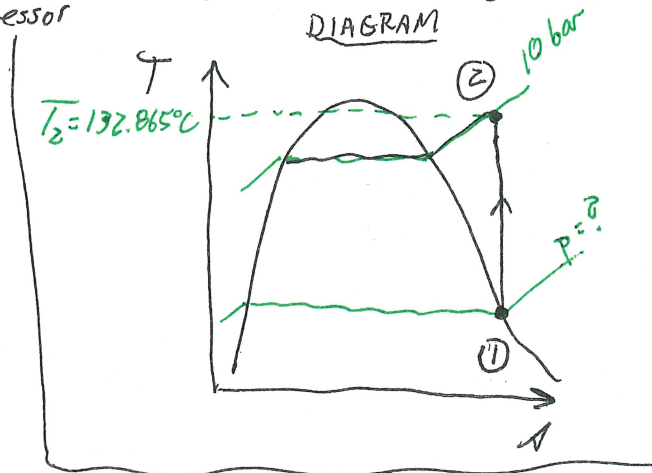
② $p = 10 \text{ bar}$, $T_2 = 132.865^\circ\text{C}$

$h_2 = 1744.54 \text{ kJ/kg}$
 $s_2 = 5.8391 \text{ kJ/kg}\cdot\text{K}$ } via interpolation

① Go to saturated tables and search for $s_g = 5.8391 \frac{\text{kJ}}{\text{kg}\cdot\text{K}}$. This occurs at $p = 1 \text{ bar}$ where $h_g = 1398.41 \text{ kJ/kg} = h_1$

So, $\dot{w}_c/\dot{m} = 1744.54 \frac{\text{kJ}}{\text{kg}} - 1398.41 \frac{\text{kJ}}{\text{kg}}$

$\dot{w}_c/\dot{m} = 346.13 \text{ kJ/kg}$ ← ANS.



I HAVE NEITHER PROVIDED OR RECEIVED HELP DURING THIS QUIZ.

SIGNATURE