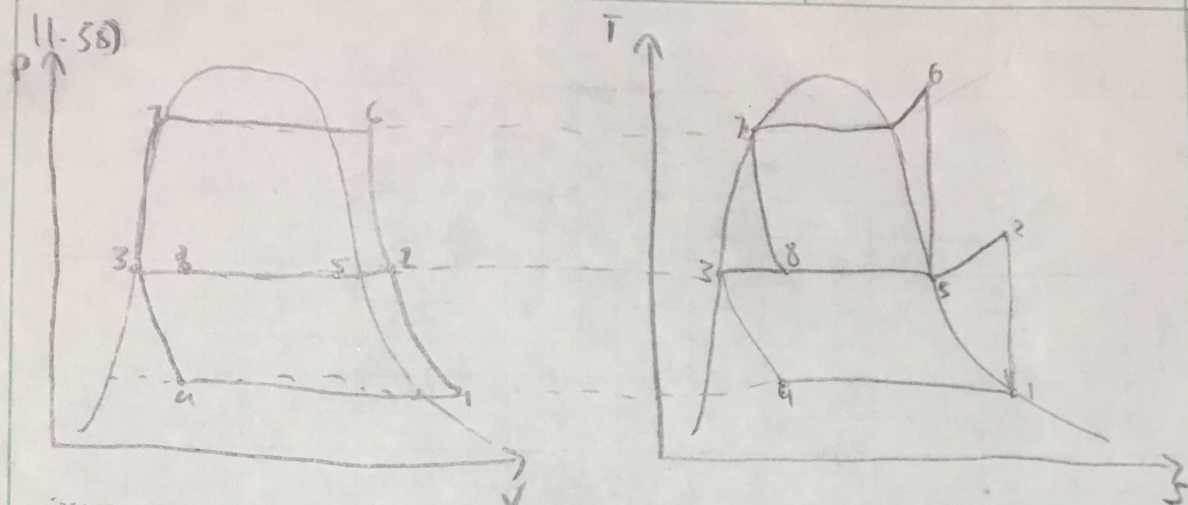




$p_1 = 160 \text{ kPa}$ $p_2 = 500 \text{ kPa}$ $p_3 = p_4$ $p_5 = p_6$ $p_7 = p_8$ $p_9 = p_8$ $p_{10} = 1400 \text{ kPa}$ $p_{11} = p_{12}$ $p_{13} = p_{14}$
 $h_1 = 241.14 \text{ kJ/kg}$ $h_3 = 73.32 \text{ kJ/kg}$ $h_4 = h_5$ $h_5 = 255.61 \text{ kJ/kg}$ $h_6 = 1400 \text{ kPa}$ $h_7 = p_6$ $h_8 = h_9$
 $s_1 = 0.420 \text{ kJ/kg} \cdot \text{K}$

$h_{2s} = 263.48 + (273.03 - 263.48) \left(\frac{0.420 - 0.1364}{0.974 - 0.1364} \right)$
 $h_{2s} = 264.55 \text{ kJ/kg}$

$\eta_c = \frac{h_{2s} - h_1}{h_2 - h_1} = 0.80 = \frac{264.55 - 241.14}{h_2 - 241.14}$

$h_2 = 270.41 \text{ kJ/kg}$

$\dot{m}_A (h_5 - h_8) = \dot{m}_B (h_2 - h_5)$

$\dot{m}_A (255.61 - 127.25) = 0.11 (270.41 - 73.32)$

$\dot{m}_A = 0.1689 \text{ kg/s}$

$\dot{Q}_c = \dot{m}_B (h_1 - h_9)$

$\dot{Q}_c = 0.11 (241.14 - 73.32)$

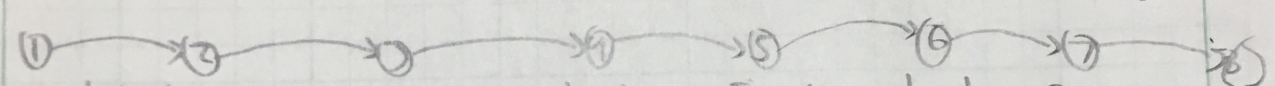
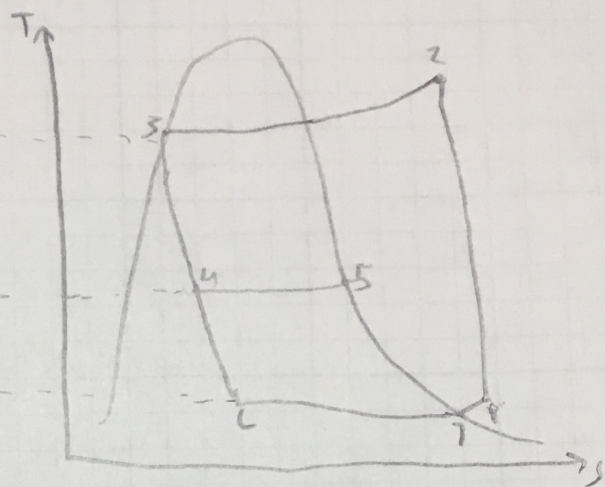
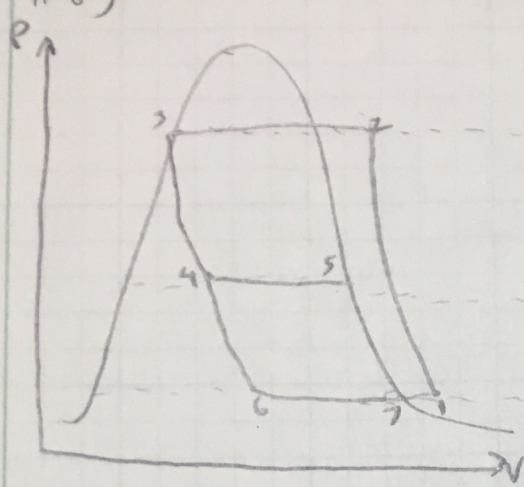
$\dot{Q}_c = 18.46 \text{ kW}$

$\dot{W}_{in} = \dot{m}_A (h_6 - h_5) + \dot{m}_B (h_2 - h_1) = 0.11 (288.04 - 255.61) + 0.1689 (270.41 - 241.14)$

$\dot{W}_{in} = 6.696 \text{ kW}$

$\text{COP} = \frac{\dot{Q}_c}{\dot{W}_{in}} = \frac{18.46}{6.696} = 2.12$

11.60)



$$h_1 = \frac{m_1 h_{f1} + m_2 h_{g1}}{m}$$

$$h_1 = \frac{(0.04243)(-252.5) + (0.5757)(234.4)}{0.6181}$$

$$h_1 = 241.26 \text{ kJ/kg}$$

$$P_1 = 1.01 \text{ MPa}$$

$$P_2 = 800 \text{ kPa}$$

$$m_1 = \dot{m} - m_2$$

$$m_1 = 0.1 - 0.05757$$

$$m_1 = 0.04243 \text{ kg/s}$$

$$Q_L = \dot{m}_2 (h_1 - h_2)$$

$$\dot{m}_2 = \frac{Q_L}{h_1 - h_2} = \frac{8 \text{ kJ/s}}{234.4 - 241.26}$$

$$\dot{m}_2 = 0.05757 \text{ kg/s}$$

cooling rate:

$$\dot{Q}_L = \dot{m}_2 (h_1 - h_2) = 0.04243 \text{ kg/s} (252.5 - 241.26)$$

$$\dot{Q}_L = 6.576 \text{ kW}$$

$$COP = \frac{\dot{Q}_L}{\dot{W}_{in}}$$

$$\dot{W}_{in} = \dot{m} (h_2 - h_1) = 0.1 \text{ kg/s} (276.32 - 241.26)$$

$$\dot{W}_{in} = 4.506 \text{ kW}$$

$$COP = \frac{6.576 + 8}{4.506 \text{ kW}}$$

$$COP = 3.24$$

Interpolated

$$h_1 = 234.4 + (239.7 - 233.4) \frac{26.4 - 26}{-26 - (-26)}$$

$$h_1 = 234.49 \text{ kJ/kg}$$