{Question 4E}

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P_1=4*convert(bar, kPa)
x_1=1
P_3=9*convert(bar, kPa)
x_3=0
n_isentropic=0.70
mdot=3[kg/min]
n_isentropic=(h_2s-h_1)/(h_2-h_1)

{Part a}
h_1=enthalpy(R134a,P=P_1,x=x_1)
s_1=entropy(R134a,P=P_1,x=x_1)

P_2=P_3
s_2s=s_1
h_2s=enthalpy(R134a,P=P_2,s=s_2s)

W=mdot*(h_2-h_1)/convert(min,sec) {Power of the Compressor: W = 1.2 kW}

{Part b}
h_3=enthalpy(R134a,P=P_3,x=x_3)
capacity=mdot*(h_1-h_3)/convert(min,sec)*convert(kW,tons) {Refrigerating Capacity: capacity = 0.343 tons}

{Part c}
COP=mdot*(h_1-h_4)/convert(min,sec)/W {Coefficient of Preformance: COP = 6.412}

{Part d}
T_1=temperature(R134a,P=P_1,x=x_1)
s_3=entropy(R134a,P=P_3,x=x_3)
T_4=T_1
s_4=s_3
P_4=P_1
T_2=temperature(R134a,P=P_2,h=h_2)
T_3=temperature(R134a,P=P_3,s=s_3)
s_2=entropy(R134a,P=P_2,h=h_2)
h_4=enthalpy(R134a,T=T_4,s=s_4)
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SOLUTION

Unit Settings: SI C kPa kJ mass deg

capacity = 2.189 [tons]	COP = -9999	h_1 = 255.6 [kJ/kg]
h_2 = -9999 [kJ/kg]	h_{2s} = 272.4 [kJ/kg]	h_3 = 101.6 [kJ/kg]
h_4 = 99.52	mdot = 3 [kg/min]	$n_{isentropic}$ = 0.7
P_1 = 400 [kPa]	P_2 = 900 [kPa]	P_3 = 900 [kPa]
P_4 = 400	s_1 = 0.9269 [kJ/kg-K]	s_2 = -9999
s_{2s} = 0.9269 [kJ/kg-K]	s_3 = 0.3738	s_4 = 0.3738
T_1 = 8.91	T_2 = -9999	T_3 = 35.51
T_4 = 8.91	W = -9999 [kW]	x_1 = 1
x_3 = 0		

No unit problems were detected.

Lookup Table: Lookup 1

	Temperature [C]	Pressure [kPa]	Enthalpy [kJ/kg]	Entropy [KJ/kg-K]
Row 1	8.91	400	255.6	0.9269

Lookup Table: Lookup 1

	Temperature [C]	Pressure [kPa]	Enthalpy [kJ/kg]	Entropy [KJ/kg-K]
Row 2	45.05	900	279.6	0.9498
Row 3	35.51	900	101.6	0.3738
Row 4	8.91	400	99.52	0.3738
Row 5	8.91	400	255.6	0.9269