```
{Question 6E}
T_1=5[C]
P_1=P_6

s_1=s_2
P_2=18*convert(bar,kPa)

T_3=45[C]
P_3=18*convert(bar,kPa)

P_4=18*convert(bar,kPa)

h_5=h_4
T_5=T_6

P_6=2*convert(bar,kPa)
x_6=1

mdot=8[kg/min]

{Part a}
(h_4-h_3)=(h_6-h_1)

h_1=enthalpy(Ammonia,T=T_1,P=P_1)
h_3=enthalpy(Ammonia,T=T_3,P=P_3)
h_6=enthalpy(Ammonia,P=P_6,x=x_6)
T_6=temperature(Ammonia,P=P_6,x=x_6)

capactiy=mdot*(h_6-h_5)*convert(kJ/min,tons) {Refrigeration Capacity: capacity = 40.94 tons}

{Part b}
s_1=entropy(Ammonia,T=T_1,P=P_1)
h_2=enthalpy(Ammonia,P=P_2,s=s_2)
Wdot_compressor=mdot*(h_2-h_1)/convert(min,sec) {Compressor Power: Wdot_compressor = 49.92 kW}

{Part c}
COP=capactiy*convert(tons, kW)/Wdot_compressor {Coefficient of Preformance: COP = 2.884}

{Part d}
P_5=pressure(Ammonia,T=T_5,h=h_5)
s_3=entropy(Ammonia,T=T_3,P=P_3)
s_4=entropy(Ammonia,P=P_4,h=h_4)
s_5=entropy(Ammonia,T=T_5,h=h_5)
s_6=entropy(Ammonia,P=P_6,x=x_6)
T_2=temperature(Ammonia,P=P_2,s=s_2)
T_4=temperature(Ammonia,P=P_4,h=h_4)
```

SOLUTION

Unit Settings: SI C kPa kJ mass deg

capactiy = 40.94 [tons]	COP = 2.884
h_1 = 1495 [kJ/kg]	h_2 = 1870 [kJ/kg]
h_3 = 415.5 [kJ/kg]	h_4 = 359.4 [kJ/kg]
h_5 = 359.4 [kJ/kg]	h_6 = 1439 [kJ/kg]
mdot = 8 [kg/min]	P_1 = 200 [kPa]
P_2 = 1800 [kPa]	P_3 = 1800 [kPa]
P_4 = 1800 [kPa]	P_5 = 200 [kPa]
P_6 = 200 [kPa]	s_1 = 6.097 [kJ/kg-k]
s_2 = 6.097 [kJ/kg-k]	s_3 = 1.722 [kJ/kg-K]
s_4 = 1.542 [kJ/kg-K]	s_5 = 1.64 [kJ/kg-K]

s_6 = 5.886 [kJ/kg-K]
T_2 = 181.8 [C]
T_4 = 33.6 [C]
T_6 = -18.85 [C]
x_6 = 1

T_1 = 5 [C]
T_3 = 45 [C]
T_5 = -18.85 [C]
$\dot{W}_{compressor}$ = 49.92 [kW]

No unit problems were detected.
EES suggested units (shown in purple) for h_2 h_5 P_5 s_3 s_4 s_5 .

Lookup Table: Lookup 1

	Temperature [C]	Pressure [kPa]	Entropy [kJ/kg-K]	Enthalpy [kJ/kg]
Row 1	5	200	6.097	1495
Row 2	181.8	1800	6.097	1870
Row 3	45	1800	1.722	415.5
Row 4	33.6	1800	1.542	359.4
Row 5	-18.85	200	1.64	359.4
Row 6	-18.85	200	5.886	1439
Row 7	5	200	6.097	1495