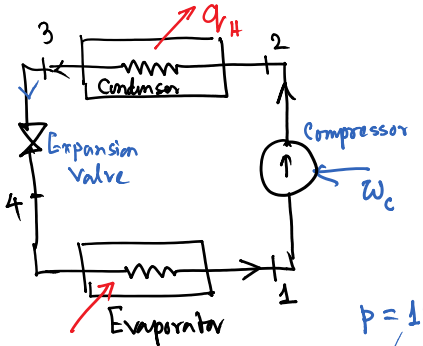
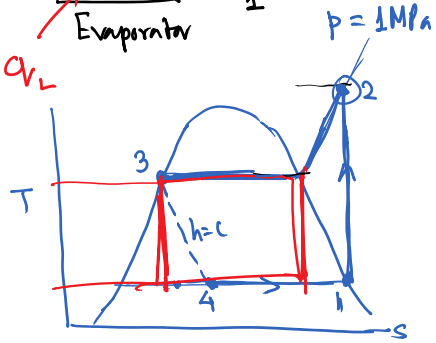
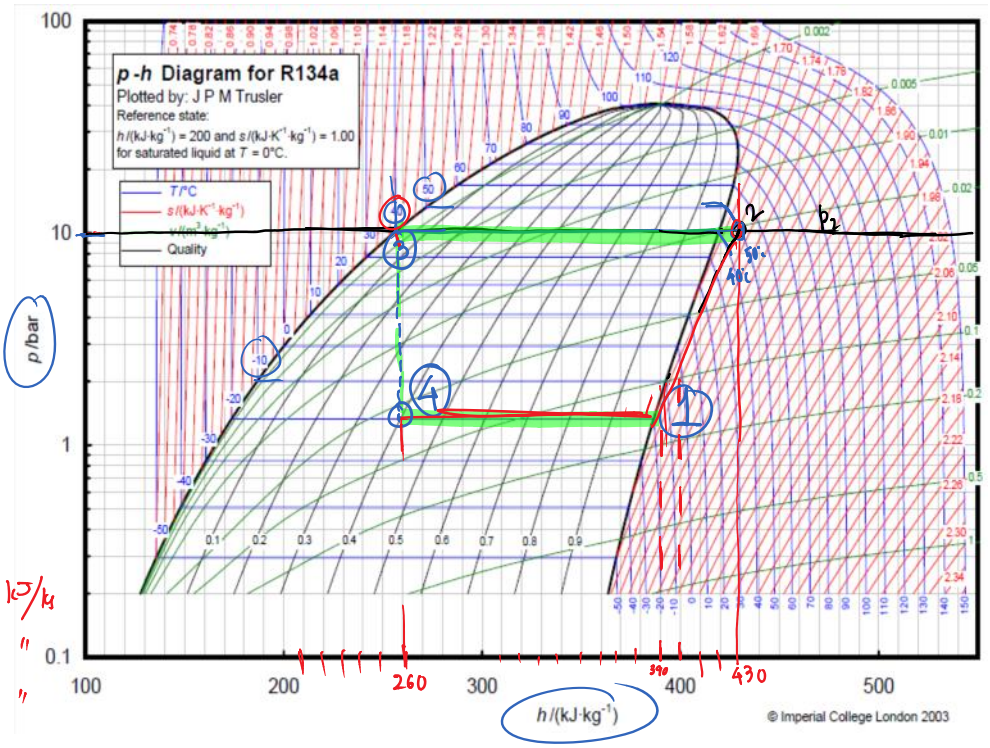
Vapor Compression Refrigeration

A refrigerator with R-134a as the working fluid has a minimum temperature of −10°C and a maximum pressure of 1 MPa. Assume an ideal refrigeration cycle. Find the specific heat transfer from the cold space and that to the hot space. and determine the COP.







$q_L = (h_1 - h_4) = 130$ kJ/kg. $h_1 = 390$ kJ/kg

$w_c = (h_2 - h_1) = 40$ kJ/kg $h_2 = 430$ "

$q_H = (h_2 - h_3) = 170$ kJ/kg. $h_4 = 260$ "

$$COP = \frac{136}{40} = 3.25$$

$T_L = 263\,K$, $T_H\big|_{at\ 1\ MPa} = 273 + 40 = 313\,K$

$$(COP)_{Carnot} = \frac{T_L}{T_H - T_L} = \frac{263}{50} = \boxed{5.26}$$