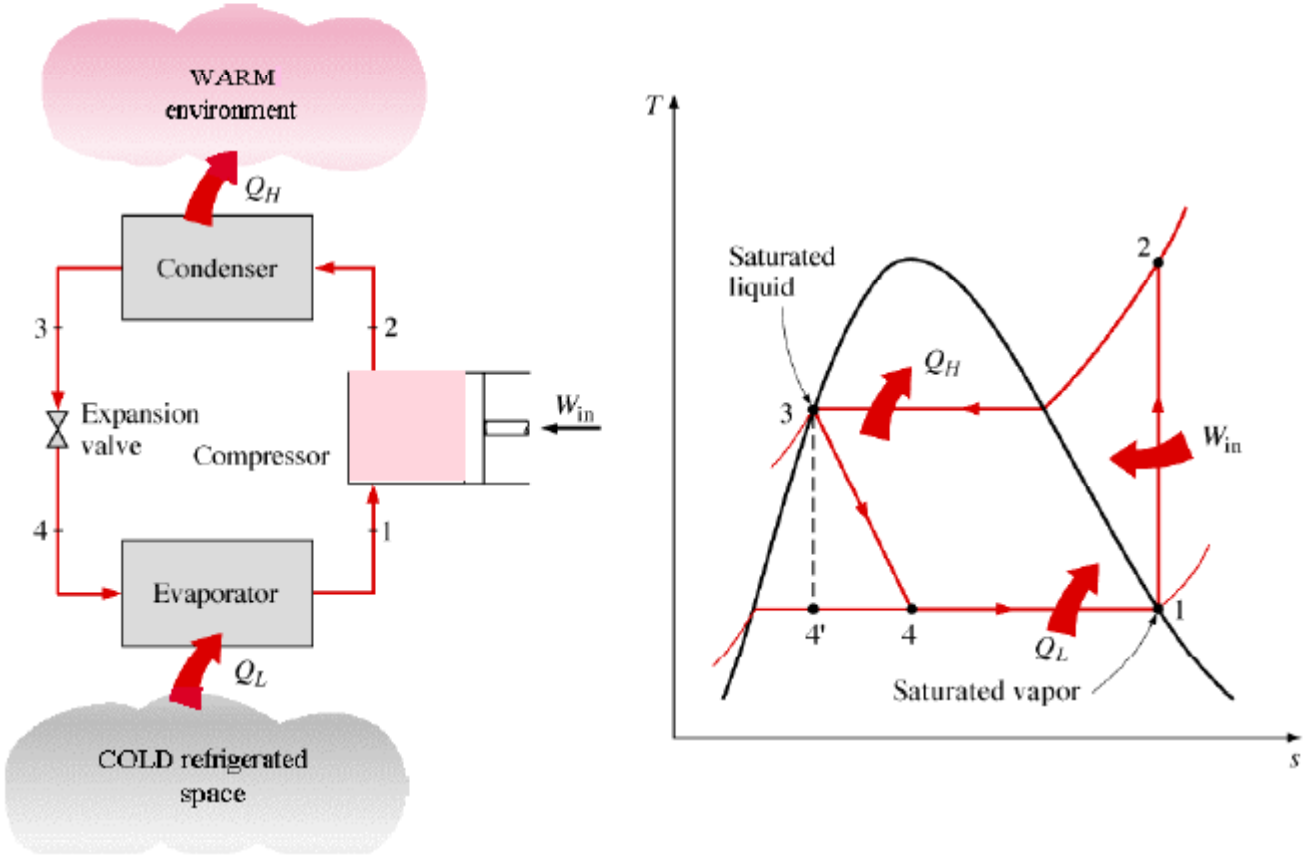
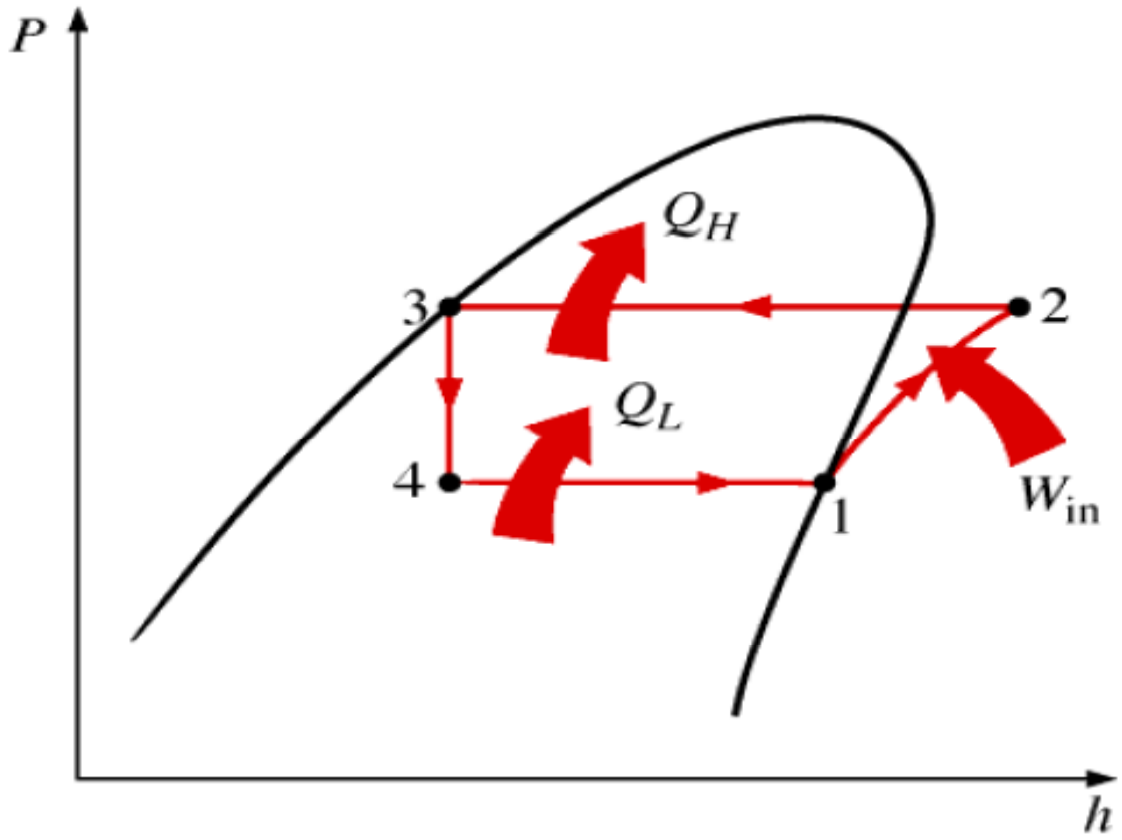
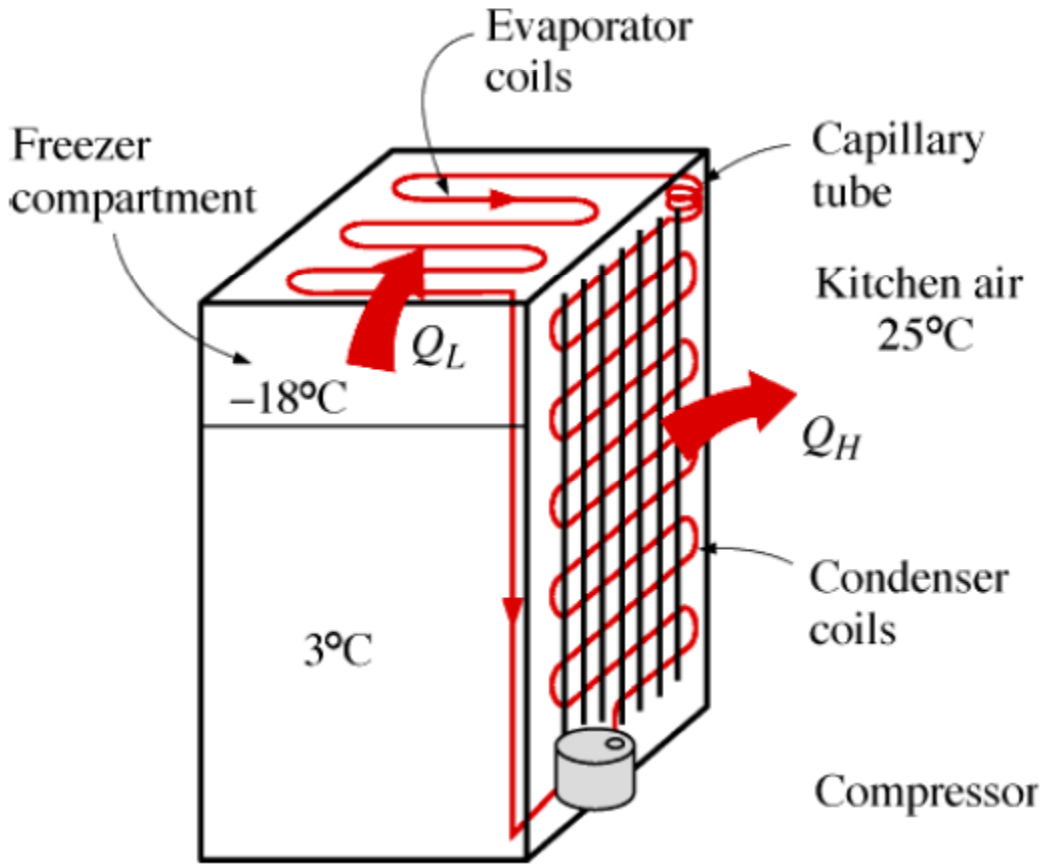
Schmatic and *T-s* Diagram for Ideal Vapor-Compression Refrigeration Cycle



P-h Diagram of an Ideal Vapor-Compression Refrigeration Cycle



Ordinary Household Refrigerator



Four Processes of the Ideal Vapor-Compression Refrigeration Cycle

- The Ideal Vapor-Compression Refrigeration Cycle

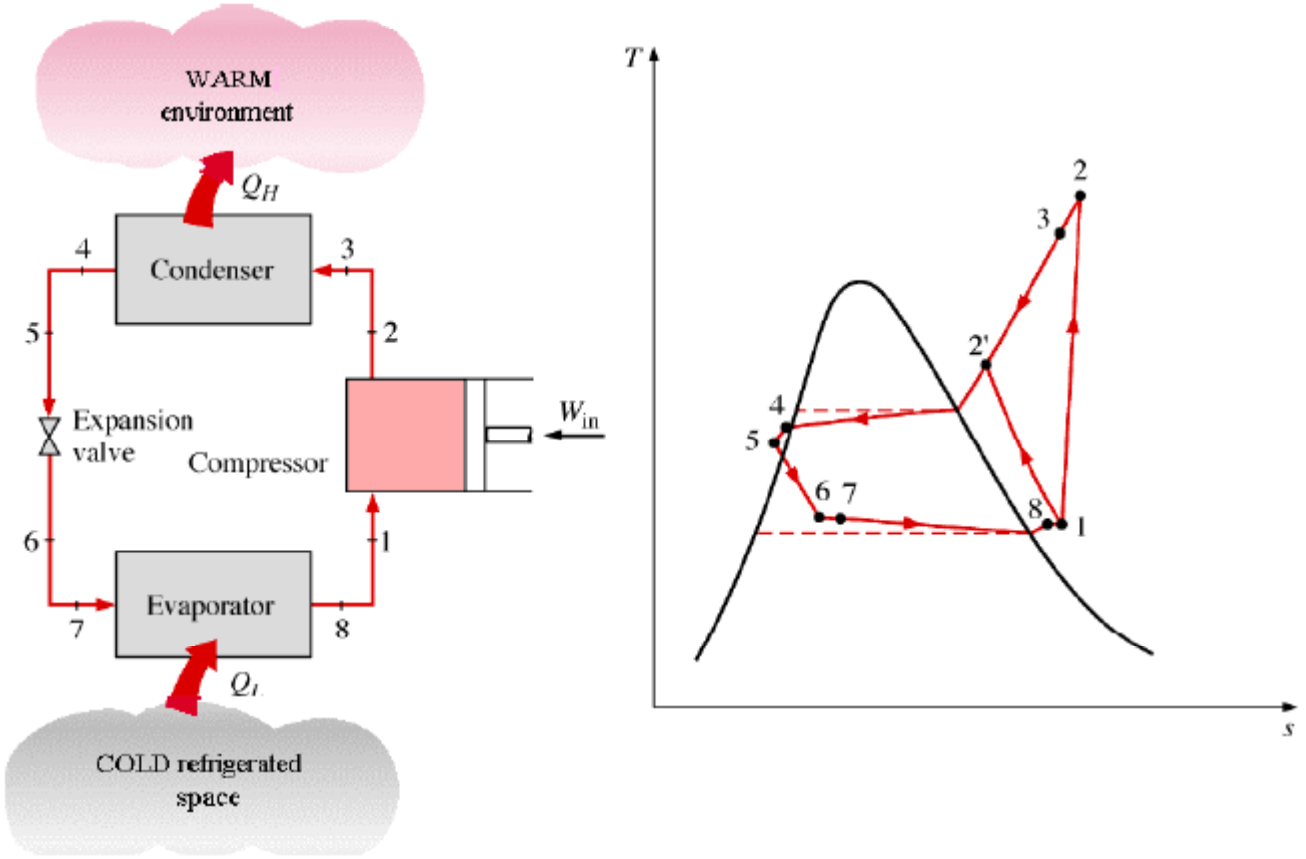
Process	Description
1-2	Isentropic compression
2-3	Constant pressure heat rejection in the condenser
3-4	Throttling in an expansion valve
4-1	Constant pressure heat addition in the evaporator

1st and 2nd Law Analysis of Ideal Vapor-Compression Refrigeration Cycle

- **Results of First and Second Law Analysis for Steady-Flow**

Component	Process	First Law Result
Compressor	s = Const.	$\dot{W}_{in} = \dot{m}(h_2 - h_1)$
Condenser	P = Const.	$\dot{Q}_H = \dot{m}(h_2 - h_3)$
Throttle Valve	$\Delta s > 0$	$h_4 = h_3$
Evaporator	P = Const.	$\dot{Q}_L = \dot{m}(h_1 - h_4)$

Schmatic and *T-s* Diagram for Actual Vapor-Compression Refrigeration Cycle



COP of An Ideal Vapor-Compression Refrigeration Cycle

$$COP_R = \frac{\dot{Q}_L}{\dot{W}_{net,in}} = \frac{h_1 - h_4}{h_2 - h_1}$$

$$COP_{HP} = \frac{\dot{Q}_H}{\dot{W}_{net,in}} = \frac{h_2 - h_3}{h_2 - h_1}$$