

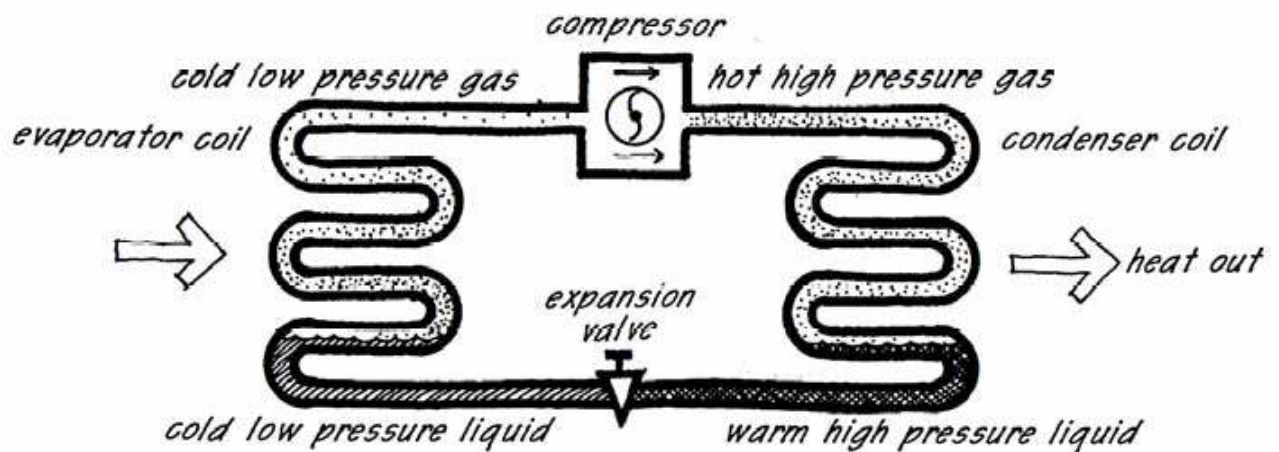
The basic kitchen refrigerator is the simplest example of a heat pump. It uses basic scientific principles to transfer heat out of its cold box.

The four main components are the:

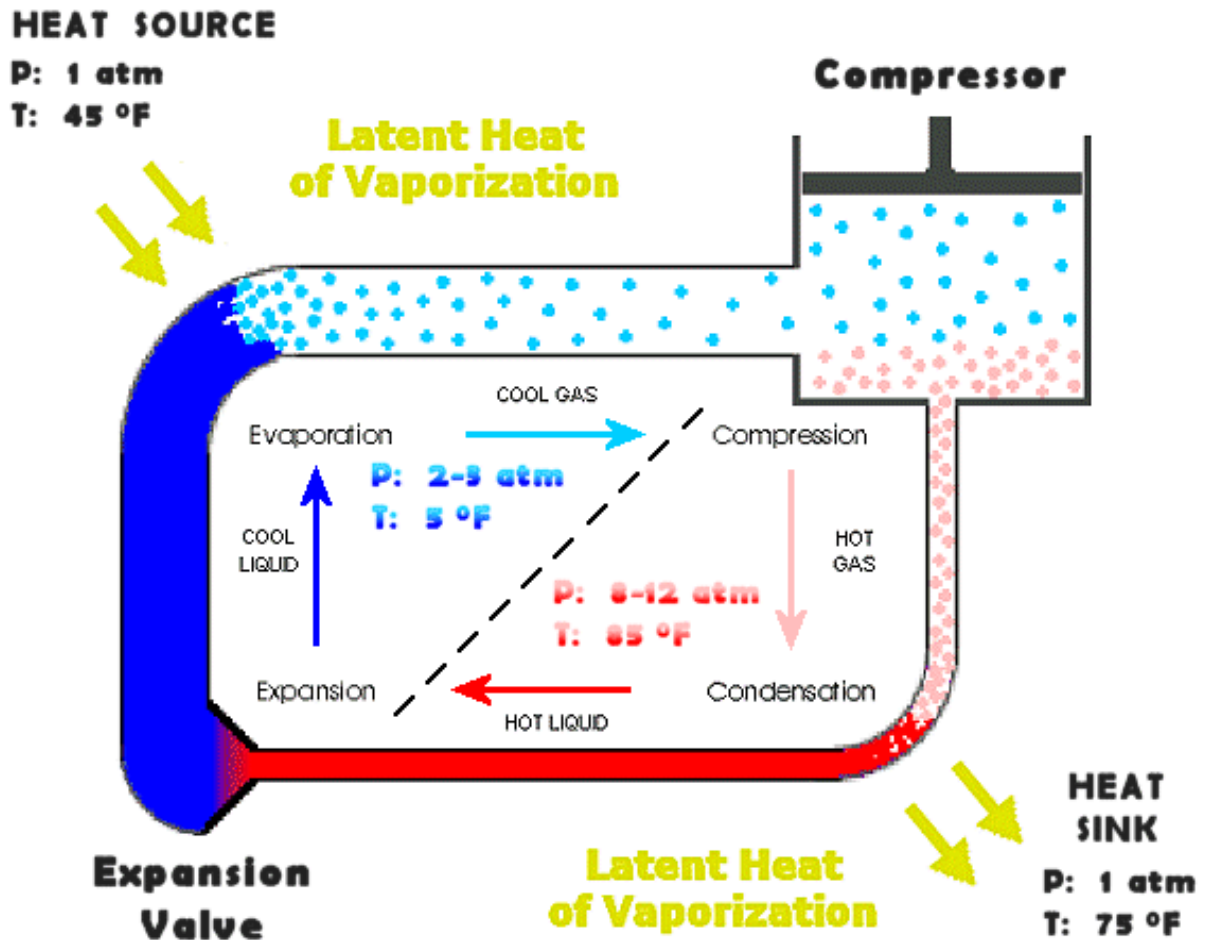
- **Compressor:** Increases the pressure of the refrigerant vapor, pushing it through the system, which increases the vapor's temperature above that of the surrounding kitchen.
- **Condenser coils:** Refrigerant vapor condenses to a liquid here. (Note: Usually behind or under the refrigerator,)
- **Expansion valve:** Produces a sudden drop in refrigerant pressure, causing it to boil; only passes as much liquid as can be completely vaporized in the evaporator.
- **Evaporator coils:** Latent heat of refrigerant vaporization is absorbed from the inside the cold box.

Basic Scientific Principles

- **Heat energy** is the collective random motion of molecules, and **temperature** is a measure of how fast the molecules are moving.
- When a gas is compressed, the number of molecular collisions increases due to the increased concentration of molecules and its temperature rises.
- Boiling point varies proportionally with pressure. A liquid can be boiled at any temperature simply by reducing the applied pressure below its saturated vapor pressure at that temperature.



Fuller Moore, Environmental Control Systems,
McGraw Hill Inc., 1993, pg 220.



- **Latent heat** is the energy needed to overcome the molecular interactions that tend to organize matter, such that it can undergo a phase change into a more disorganized state.
- The latent heat contained in a phase change is very great, much greater than the heat stored in a simple temperature change.