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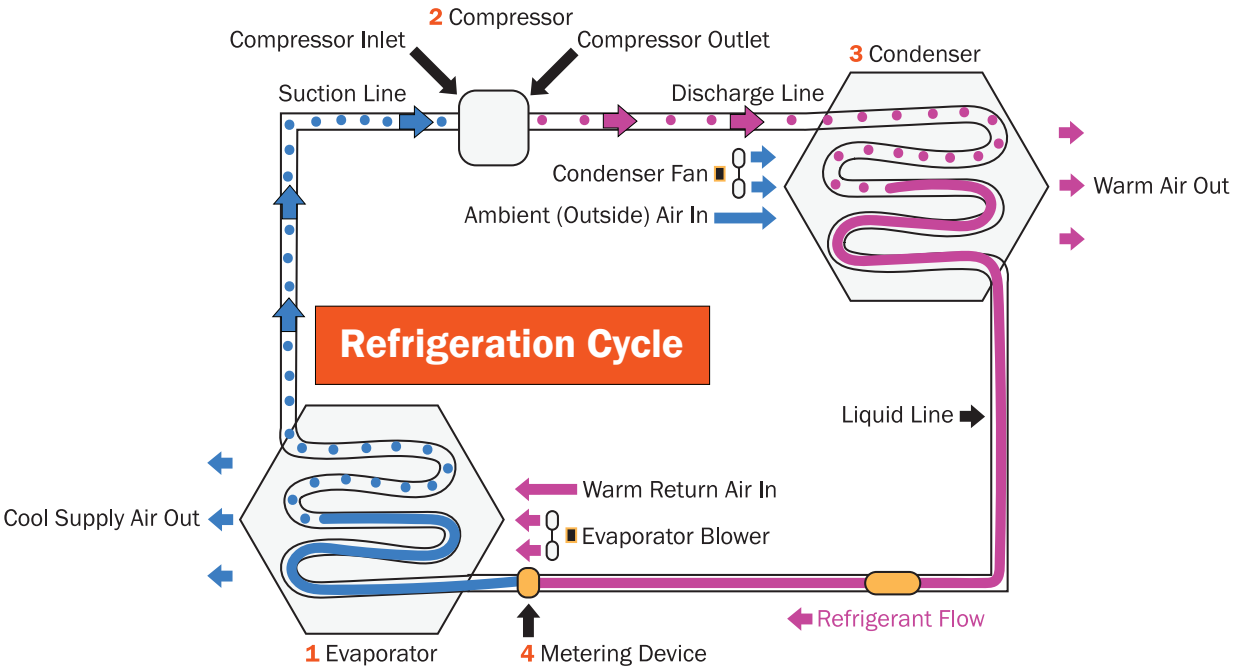
LAWS OF THERMODYNAMICS

SCIENCE OF ENERGY

CONCEPT Energy is the ability to do work and/or bring about a change. It exists in many forms, such as heat, light, chemical energy, and electrical energy. Thermodynamics is the study of energy.

BACKGROUND

The word thermodynamics stems from the Greek words meaning “movement of heat.” Its foundation is based on the idea of the conservation of energy and the fact that heat flows from cold to hot, not the other way around. Simply put, energy cannot be created or destroyed.



APPLICATION

A refrigerator can be represented schematically as a system that transfers energy from a body of low temperature to one of a high temperature. The refrigerator uses work performed by an electric motor to compress the refrigerant (a substance that evaporates at very low temperature).

It contains four major components: the compressor, condenser, expansion device, and evaporator. The system pipes refrigerant through these four components in a loop, giving the cycle its name and keeping your home cool!

REAL WORLD CONNECTIONS

-Engineering students learn about the thermodynamics of gas turbines by studying diagrams and solving equations.
-Refrigerators and air conditioners use heat and reverse the usual process by which particles are heated.
-Burning calories!
-Rubbing your hands together!
-Jet engines
-Steam engines
-Steam turbines
-Heat pumps

Make sure it measures up

FORMULAS

- **Work** is defined in terms of pressure and volume change in thermodynamic systems.
- **Pressure** is a measure of how much force is applied over a given area (P=F/A)
- **Change in volume** is equal to area multiplied by displacement (ΔV=Ad)
- **Joule** (J) is the unit of work.

First Law of Thermal Dynamics
ΔU=Q-W
↓
Change in system's internal energy=energy transferred to or from system as heat – energy transferred to or from system as work