Figures 37.1 and 37.2. Water is a substance that can be found naturally in solid, liquid, and vapor states. The extra heat required to change a standard amount of water at its boiling point to a vapor is called the latent heat of vaporization.
The latent heat of vaporization that water vapor stores is given off when the vapor condenses to a liquid. The temperature stays the same.

A sling psychrometer is used to measure relative humidity.

Typical flow of air through an automotive heat, ventilation, and air-conditioning system when placed in the heat position. The air conditioning compressor does not normally operate in the heat mode.
FIGURE 37.6 A typical heater core as installed in an HVAC What Is an Auxiliary Electric Water Pump? housing.

FIGURE 37.7 The evaporator removes heat from the air that enters a vehicle by transferring it to the surrounding environment.

FIGURE 37.8 The compressor provides the mechanical force needed to pressurize the refrigerant.
FIGURE 37.9 The condenser changes the refrigerant vapor into a liquid by transferring heat from the refrigerant to the air stream that flows between the condenser fins.

FIGURE 37.10 A typical air-conditioning system that uses an expansion valve. A temperature sensor bulb in the outlet of the evaporator controls the amount of refrigerant allowed to flow into the evaporator.

FIGURE 37.11 A typical automotive air-conditioning system that uses a cycling clutch and an orifice tube.
FIGURE 37.12 Typical orifice tube.

FIGURE 37.13 A cutaway of an air-conditioning compressor electromagnetic clutch.

FIGURE 37.14 R-134a is available in 12-oz cans as well as larger 30-lb containers.
FIGURE 37.15 A depletion of the ozone layer allows more ultraviolet radiation to reach Earth’s surface.

FIGURE 37.16 Chlorofluorocarbon molecules break apart in the atmosphere.

FIGURE 37.17 The label on a Toyota Fuel Cell Hybrid Vehicle (FCHV) showing that CO₂ is being used as the refrigerant.
FIGURE 37.18 The condenser serves the same function for both the orifice-tube and the expansion valve-type air-conditioning system, and that is to remove the heat from the refrigerant and cause the hot refrigerant vapor to condense into a hot liquid.

FIGURE 37.19 A repaired condenser refrigerant line.

FIGURE 37.20 The evaporator serves the same function for both the orifice-tube and the expansion valve-type air-conditioning system, and that is to allow the liquid refrigerant to evaporate and absorb heat from the passenger compartment.
FIGURE 37.21 Expansion valve systems store excess refrigerant in a receiver-drier, which is located in the high-side liquid section of the system, whereas orifice-tube systems store excess refrigerant in an accumulator located in the low-side vapor section of the system.

FIGURE 37.22 A typical accumulator used in a cycling clutch orifice-tube (CCOT) system.

FIGURE 37.23 Rigid lines and flexible hoses are used throughout the air-conditioning system. The line to and from the compressor must be flexible because it is attached to the engine, which moves on its mounts during normal vehicle operation.
A typical expansion valve which uses an inlet and outlet attachment for the evaporator, includes a temperature-sensing bulb that is attached to the evaporator outlet tube.

A slot cut in the ball seat inside the expansion valve permits a small amount of refrigerant and oil to pass through at all times, even when the valve is closed. This flow of oil through the system is necessary to make sure that the compressor receives the oil it needs for lubrication.

The sensing bulb is attached to the evaporator outlet line. Refrigerant inside the bulb expands or contracts in response to the evaporator temperature.
FIGURE 37.27 Pressure from the capillary tube pushes on the spring-loaded diaphragm to open the expansion valve. As the pressure in the capillary tube contracts, the reduced pressure on the diaphragm allows the valve to close.

FIGURE 37.28 An H-valve (H-block) combines the temperature-sensing and pressure-regulating functions into a single assembly.

FIGURE 37.29 An H-valve as used on a Chrysler minivan.
FIGURE 37.30 In this Chrysler system, a low-pressure cutoff switch and a cycling-clutch switch are mounted on the H-valve.

FIGURE 37.31 The orifice tube is usually located at the inlet tube to the evaporator.

FIGURE 37.32 This hybrid vehicle A/C compressor uses two scrolls; one being shaft driven and the other driven by a brushless DC motor (right).