FIGURE 13 A liquid-vapor equilibrium develops in a closed system. (a) At first there is only liquid present, but molecules are beginning to evaporate. (b) Evaporation continues at a constant rate. Some vapor molecules are beginning to condense to liquid. (c) Equilibrium has been reached between the rate of condensation and the rate of evaporation.

between liquid and gas phases, there is no net change in the amount of substance in either phase.

Equilibrium Vapor Pressure of a Liquid

Vapor molecules in equilibrium with a liquid in a closed system exert a pressure proportional to the concentration of molecules in the vapor phase. *The pressure exerted by a vapor in equilibrium with its corresponding liquid at a given temperature is called the* **equilibrium vapor pressure** *of the liquid.*

The increase in equilibrium vapor pressure with increasing temperature can be explained in terms of the kinetic-molecular theory for the liquid and gaseous states. Increasing the temperature of a liquid increases the average kinetic energy of the liquid's molecules. This energy change increases the number of molecules that have enough energy to escape from the liquid phase into the vapor phase. The resulting increased evaporation rate increases the number of molecules in the vapor phase, which in turn increases the equilibrium vapor pressure.

Because all liquids have characteristic forces of attraction between their particles, every liquid has a specific equilibrium vapor pressure at a given temperature. The stronger these attractive forces are, the smaller the percentage of liquid particles that can evaporate at any given temperature is. A low percentage of evaporation results in a low equilibrium vapor pressure is. **Volatile liquids,** *which are liquids that evaporate readily,* have relatively weak forces of attraction between their particles. Ether is a typical volatile liquid. Nonvolatile liquids do not evaporate readily, and have relatively strong attractive forces between their particles. Molten ionic compounds are examples of nonvolatile liquids.

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