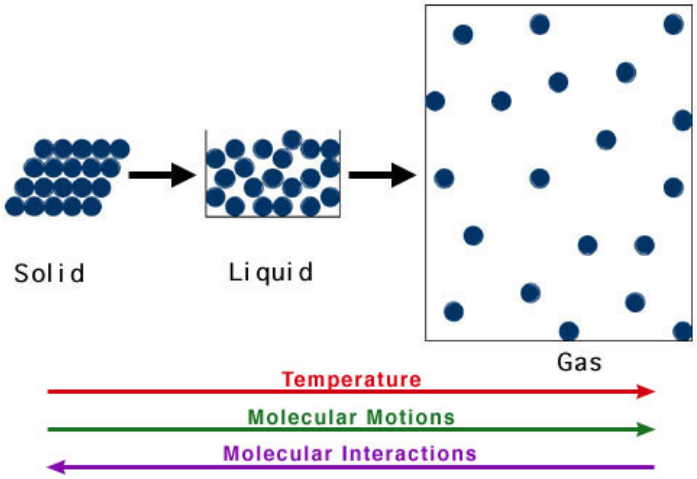
Chapter 10 – Notes

<u>Temperature, Thermal Energy, and Heat</u>

Kinetic Molecular Theory

- All matter is composed of particles (atoms and molecules)
- Particles move constantly in random directions
- Kinetic energy is the energy of a particle or an object due to its motion
- Kinetic energy is transferred when particles collide

The particles of a substance move faster when the temperature of the substance increases (solid, liquid, gas)



<u>Temperature</u> – a measure of the average kinetic energy of all the particles in a sample of matter

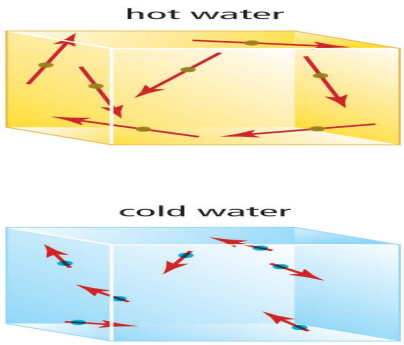


Figure 10.2 The dots represent water molecules. The arrows show how fast the water molecules are moving and in what direction.

Temperature Scales

- Fehrenheit (still used in the United States)
- Celsius (part of the metric system – used around the world, freezing = 0°, boiling = 100°)
- Kelvin (absolute zero – particles stop moving)

<u>Thermal Energy</u> – total energy of all the particles in a solid, liquid, or gas

<u>Heat</u> – amount of thermal energy that transfers from an area or object of higher temperature to an area or object of lower temperature. Ex. Cooking an egg on a frying pan.

<u>Heat Transfer</u>

- Occurs in three ways
  1. Conduction – transfer of heat from one substance to another by direct contact
     - **a.** Thermal conductors transfer heat easily (ex metals)
     - **b.** Insulators do not transfer heat easily (ex wood)

2. Convection – transfer of heat within a fluid (transfers matter as well as heat)
    a. Convection currents are caused by the movement of a fluid due to density differences created by continuous cycling of heating, cooling and reheating.
3. Radiation – transfer of energy by waves travelling outward in all directions from a source (ex solar radiation from the sun)

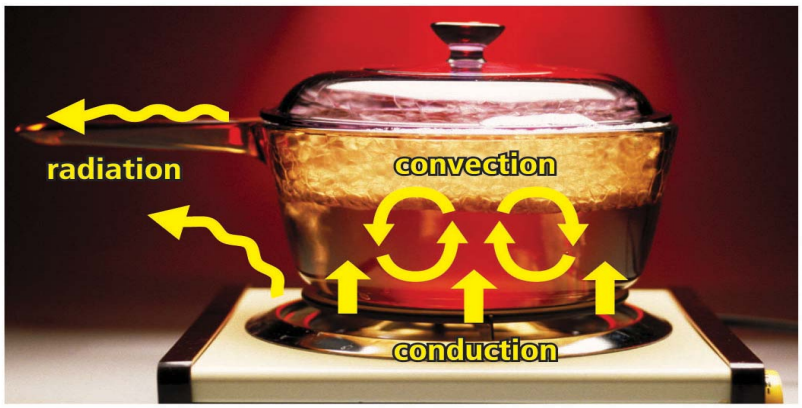


Figure 10.6 The stove element heats the pot and the pot heats the water by conduction. Water circulating in the pot transfers heat by convection. Near the stove, the air would feel warm due to heat transfer by radiation.