

## Section 6.2: Heat

### Mini Investigation: Observing Convection, page 278

**A.** In Step 3, the cold water bottle is placed on top of the warm water bottle. The cold water then falls and pushes up the warmer, less dense water and creates a convection current. This is shown by the movement of the yellow water into the blue water to form a green mixture. This green mixture has a temperature that is a combination of the temperatures for the warm water and cold water.

**B.** In Step 4, the hot water bottle is placed on top of the cold water bottle. The hot water is less dense than the cold water so it does not fall and push up the colder, denser water. No convection current is created and therefore, the two coloured waters do not mix. The colours of the waters stay pretty much the same.

### Section 6.2 Questions, page 280

1. Thermal energy is the *sum* of the potential and kinetic energies possessed by the particles in a substance, but temperature is a measure of the *average* kinetic energy of the particles in a substance. Heat is the transfer of that thermal energy from a substance with a higher temperature to a substance with a lower temperature.

2. Thermal conduction is the movement of thermal energy from a warmer object to a colder object when those objects are touching. Convection is the transfer of thermal energy through a fluid that occurs when a colder, denser fluid falls and pushes a warmer, less dense fluid upwards. Radiation is the movement of thermal energy as electromagnetic waves.

3. A tile floor feels colder than a thick carpet on my bare feet because tile is a better conductor. It allows the thermal energy in my feet to pass from my feet to the tile. The thick carpet is a thermal insulator so it does not allow the thermal energy to move out of my feet.

4. The 4 % of the electricity lost in an inefficient furnace is released as exhaust or heats the furnace itself rather than heating the home.

5. (a) A copper pot is used to heat food because copper is a good thermal conductor and transfers the thermal energy from the stove to the food.

(b) A wooden spoon is used to stir food because it's a good thermal insulator and doesn't transfer the thermal energy from the food into the cook's hand.

(c) A metal ice-cube tray is a good thermal conductor and transfers the thermal energy out of the water and into the freezer, making the ice freeze faster.

(d) A down-filled sleeping bag is a good thermal insulator because it traps air between the feathers. Both air and feathers are good thermal insulators so they slow down the transfer of thermal energy from the sleeper's body to the external environment.