Chapter 7 HW Answers

Review Questions:

2. The loose electrons allow for more collisions which results in better conduction.

15. The differences in the Earth's daytime and nighttime temperatures would be much greater.

29. A liquid molecule must gain energy to phase change into a gas. A liquid molecule must lose energy to phase change into a solid.

Exercises:

1. The temperature will not rise when a fur coat is wrapped around a thermometer; the fur coat does not transfer heat to the thermometer, but rather slows heat loss from the thermometer.

26. The liquid molecules of saliva will gain energy from the wind and evaporate.

32. No. Pressure and temperature are directly related (PV = nkT). The temperature of boiling water in space is very different than temperature of boiling water anywhere on Earth. The boiling water in space would be too cold to cook anything.

38. It takes a lot of energy to change the temperature of water, so it will be hard to freeze it and whatever is in thermal equilibrium with it.

Problems:

4. This is an energy conservation question.

$GPE = Q$

$mgh = mL_f$ (mass cancels)

$gh = L_f$ (solve for h)

$h = \frac{L_f}{g} = \frac{335{,}000\ J/kg}{9.81\ m/s^2} =$ **34,149 m (or about 34 km)**

6. The idea here is that the iron and the ice will reach thermal equilibrium. To do so, the iron must cool, and some of the ice will melt.

$Q = cm\Delta T$ Iron is going to cool; change temperature

$Q = mL_f$ Ice is going to change phase

Assume energy conservation; all heat energy from the iron is transferred to the ice.

$Q(\text{iron}) = Q(\text{ice})$

$cm_{iron}\Delta T = m_{ice}L_f$

$(0.11 \text{ cal/g-}^oC)(50 \text{ g})(80^oC) = m_{ice}(79.7 \text{ cal/g})$

$m_{ice} = 5.52$ g

Additional:

A. Melt: $Q = mL_f = (0.004 \text{ kg})(3.35 \times 10^5 \text{ J/kg}) =$ **1340 J**

Change T: $Q = cm\Delta T = (4{,}186 \text{ J/kg}^oC)(0.004 \text{ kg})(100\ ^oC) =$ **1674 J**

Vaporize: $Q = mL_v = (0.004 \text{ kg})(2.26 \times 10^6 \text{ J/kg}) =$ **9,040 J**

B. Store Heat: water, human body, ethyl alcohol
Conduct Heat: diamond, silver, copper

a) The materials in each list are <u>not</u> the same.

b) No. If it is a good conductor, it will lose heat rapidly as well as gain it rapidly. A good conductor does not hold onto heat well.

C. The warmer fluid is buoyed upward by the cooler fluid in convection. The warm fluid floats.

D. Once the water is boiling, it cannot increase temperature any further. Any extra energy added to the boiling water will cause more steam to be produced (more phase change), but will not change the temperature of the water.