**Chemistry 17.1**

**The Flow of Energy—Heat and Work**

**The temperature of lava from a volcano ranges from 550°C to 1400°C. As lava flows, it loses heat and begins to cool. You will learn about heat flow and why some substances cool down or heat up more quickly than others.**

**Energy Transformations**

In what direction does heat flow?

**Heat**, represented by *q*, is energy that transfers from one object to another because of a temperature difference between them.

Heat always flows from a warmer object to a cooler object.

**Thermochemistry** is the study of energy changes that occur during chemical reactions and changes in state.

The energy stored in the chemical bonds of a substance is called **chemical potential energy.**

When fuel is burned in a car engine, chemical potential energy is released and is used to do work.

**Exothermic and Endothermic Processes**

What happens in endothermic and exothermic processes?

In an endothermic process, the system gains heat as the surroundings cool down.

In an exothermic process, the system loses heat as the surroundings heat up.

In studying energy changes, you can define a **system** as the part of the universe on which you focus your attention. The **surroundings** include everything else in the universe.

The **law of conservation of energy** states that in any chemical or physical process, energy is neither created nor destroyed.

An **endothermic process** is one that absorbs heat from the surroundings.

An **exothermic process** is one that releases heat to its surroundings.

**Units for Measuring Heat Flow**

In what units is heat flow measured?

Heat flow is measured in two common units, the calorie and the joule.

The energy in food is usually expressed in Calories.

**Heat Capacity and Specific Heat**

On what two factors does the heat capacity of an object depend?

The heat capacity of an object depends on both its mass and its chemical composition.

The amount of heat needed to increase the temperature of an object exactly 1°C is the **heat capacity** of that object.

The specific heat capacity, or simply the **specific heat**, of a substance is the amount of heat it takes to raise the temperature of 1 g of the substance 1°C.

Water releases a lot of heat as it cools. During freezing weather, farmers protect citrus crops by spraying them with water.

Because it is mostly water, the filling of a hot apple pie is much more likely to burn your tongue than the crust.

**17.1 Section Quiz.**

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| 1. The energy released when a piece of wood is burned has been stored in the wood as  a. sunlight.  b. heat.  c. calories.  d. chemical potential energy.  2. Which of the following statements about heat is false?  a. Heat is the same as temperature.  b. Heat always flows from warmer objects to cooler objects.  c. Adding heat can cause an increase in the temperature of an object.  d. Heat cannot be specifically detected by senses or instruments. | 3. Choose the correct words for the spaces: In an endothermic process, the system \_\_\_\_\_\_\_\_ heat when heat is \_\_\_\_\_\_\_\_ its surroundings, so the surroundings \_\_\_\_\_\_\_\_\_\_\_\_\_.  a. gains, absorbed from, cool down.  b. loses, released to, heat up.  c. gains, absorbed from, heat up.  d. loses, released to, cool down.  4. Which of the relationships listed below can be used to convert between the two units used to measure heat transfer?  a. 1 g = 1ºC  b. 1 J = 0.2390 cal  c. 1ºC = 1 cal  d. 1 g = 4.184 J  5. Assuming that two samples of different materials have equal mass, the one that becomes hotter from a given amount of heat is the one that  a. has the higher specific heat capacity.  b. has the higher molecular mass.  c. has the lower specific heat capacity.  d. has the higher density. |