

Chapter 16 Thermal Energy and Heat

Section 16.2 Heat and Thermodynamics**(pages 479–483)**

This section discusses three kinds of thermal energy transfer and introduces the first, second, and third laws of thermodynamics.

Reading Strategy (page 479)

Building Vocabulary As you read this section, add definitions and examples to complete the table. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

Transfer of Thermal Energy	
Definitions	Examples
Conduction: transfer of thermal energy with no net transfer of matter	Frying pan handle heats up
Convection: transfer of thermal energy when particles of a fluid move from one place to another	Hot air circulating in an oven
Radiation: transfer of energy by waves moving through space	Heating coil of a stove glows

Conduction (pages 479–480)

- The transfer of thermal energy with no overall transfer of matter is called conduction.
- Is the following sentence true or false? Conduction is faster in metals than in other solids because metals have free electrons that transfer thermal energy. true
- Circle the letter of each sentence that is true about conduction.
 - Thermal energy is transferred without transfer of matter.
 - Conduction can occur between materials that are not touching.
 - In most solids, conduction takes place as particles vibrate in place.
- Complete the table about conduction.

Conduction		
Type of Material	Quality of Conduction	Two Examples
Thermal conductor	Conducts thermal energy well	Copper; aluminum
Thermal insulator	Conducts thermal energy poorly	Wood; air

Chapter 16 Thermal Energy and Heat**Convection (pages 480–481)**

5. The transfer of thermal energy when particles of a fluid move from one place to another is called convection.
6. When a fluid circulates in a loop as it alternately heats up and cools down, a(n) _____ occurs. Circle the correct answer.
- air current convection current heat circulation

Radiation (page 481)

7. The transfer of energy by waves moving through space is called radiation.
8. Circle the letter of each sentence that is true about radiation.
- a. Energy is transferred by waves.
- b. All objects radiate energy.
- c. The amount of energy radiated from an object decreases as its temperature increases.

Thermodynamics (pages 482–483)

9. Thermodynamics is the study of conversions between thermal energy and other forms of energy.
10. Is the following sentence true or false? Energy cannot be created or destroyed, but it can be converted into different forms. true
11. Circle the letter of the correct answer. According to the second law of thermodynamics, when can thermal energy flow from a colder object to a hotter object?
- a. only when you use a heat pump
- b. only when you do work on the system
- c. whenever two objects touch each other
12. Define waste heat. Waste heat is thermal energy that is not converted into work.
13. Is the following sentence true or false? Scientists have created a heat engine with 100 percent efficiency by reducing the temperature of the outside environment to absolute zero. false
14. Is the following sentence true or false? Matter can be cooled to absolute zero. false