Chapter 16  Thermal Energy and Heat

Section 16.1 Thermal Energy and Matter
(pages 474–478)

This section defines heat and describes how work, temperature, and thermal energy are related to heat. It also discusses thermal expansion and contraction of materials, and explains uses of a calorimeter.

Reading Strategy (page 474)

Previewing  Before you read, preview the figures in this section and add two more questions to the table. As you read, write answers to your questions. 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.

<table>
<thead>
<tr>
<th>Thermal Energy and Matter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questions About Thermal Energy and Matter</td>
</tr>
<tr>
<td>Which has more thermal energy, a cup of tea or a pitcher of juice?</td>
</tr>
</tbody>
</table>

Work and Heat (page 474)

1. Heat is the transfer of thermal energy from one object to another as the result of a difference in _____________. Circle the correct answer.
   - density  
   - potential energy  
   - temperature

2. Circle the letter of each sentence that is true about heat.
   a. Heat is a fluid that flows between particles of matter.
   b. Heat flows spontaneously from hot objects to cold objects.
   c. Friction produces heat.

Temperature (page 475)

3. What is temperature? ___________________________
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4. Circle the letter of each sentence that explains what happens when an object heats up.
   a. Its particles move faster, on average.
   b. The average kinetic energy of its particles decreases.
   c. Its temperature increases.

Thermal Energy (page 475)
5. Thermal energy is the total potential and ______________ energy of all the particles in an object.
6. Is the following sentence true or false? Two substances can be the same temperature and have different thermal energies. ______________

Thermal Contraction and Expansion (page 476)
7. Is the following sentence true or false? Thermal contraction occurs when matter is heated, because particles of matter tend to move closer together as temperature increases. ______________
8. Use the terms in the box below to describe thermal expansion and contraction by completing the table.

| Increases | Thermal expansion |
| Decreases | Thermal contraction |

<table>
<thead>
<tr>
<th>Condition</th>
<th>Temperature</th>
<th>Space Between Particles</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increases</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Decreases</td>
</tr>
</tbody>
</table>

Specific Heat (pages 476–477)
9. The amount of heat needed to raise the temperature of one gram of material by one degree Celsius is called ______________.

Measuring Heat Changes (page 478)
10. What is a calorimeter? ______________

11. Is the following sentence true or false? A calorimeter uses the principle that heat flows from a hotter object to a colder object until both reach the same temperature. ______________