Section 17.1 Atmosphere Characteristics

This section describes the components and vertical structure of the atmosphere. It also explains how the relationship between Earth and the sun causes the seasons.

Reading Strategy

Comparing and Contrasting  As you read, complete the Venn diagram by comparing and contrasting summer and winter solstices. 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.

Summer Solstice

Winter Solstice

1. ☐ __________________ is the state of the atmosphere at any given time and place.

Composition of the Atmosphere

2. Circle the letter of the gas that is the largest component of the atmosphere.
   a. oxygen  b. nitrogen
   c. water vapor  d. carbon dioxide

3. ☐ Is the following sentence true or false? The source of all clouds and precipitation is water vapor. ______________________

4. ☐ Why is the ozone layer crucial to life on Earth? ______________________

Height and Structure of the Atmosphere

5. Is the following sentence true or false? Atmospheric pressure increases with height. ______________________
Chapter 17  The Atmosphere: Structure and Temperature

6. Select the appropriate letter in the figure that identifies each of the following layers of the atmosphere.
   _____ mesosphere   _____ thermosphere
   _____ troposphere   _____ stratosphere

7. ☐ In the figure, the atmosphere is divided vertically into four layers based on ____________________________

8. Circle the letter of the layer of the atmosphere that contains the ozone layer.
   a. troposphere   b. stratosphere
   c. mesosphere   d. thermosphere

Earth-Sun Relationships

9. What are Earth’s two principal motions?
   ____________________________

10. Select the appropriate letter in the figure that identifies each of the following months.
    _____ March   _____ December
    _____ June   _____ September

11. Is the following sentence true or false? At position B in the figure, the Northern Hemisphere will have longer daylight than darkness.  __________

12. ☐ What causes seasonal changes? ____________________________
Chapter 17  The Atmosphere: Structure and Temperature

Section 17.2 Heating the Atmosphere

This section describes the three ways in which heat can be transferred. It also explains what happens to solar radiation that hits Earth’s atmosphere and surface.

Reading Strategy

Using Prior Knowledge  Before you read, write your definition for each term. After you read, write the scientific definition of each term and compare it to your original definition. 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>Term</th>
<th>Your Definition</th>
<th>Scientific Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Energy Transfer as Heat

Match each description with its mechanism of energy transfer.

Description                               | Mechanism of Energy Transfer
---                                       | ---
1. transfer of heat by mass movement or circulation within a substance | a. radiation
2. transfer of heat through matter by molecular activity | b. convection
3. transfer of heat without requiring a medium to travel through | c. conduction
4. Circle the letter of the act of light bouncing off an object.
   a. absorption
   b. scattering
   c. reflection
   d. radiation
Chapter 17  The Atmosphere: Structure and Temperature

5. Complete the chart below.

<table>
<thead>
<tr>
<th>Mechanism</th>
<th>Requires direct contact?</th>
<th>Requires a medium?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conduction</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>Convection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radiation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. ☐ Is the following sentence true or false? All objects at any temperature emit radiant energy. ________________

7. ☐ Hotter objects emit ________________ total energy per unit area than colder objects do.

8. ☐ Is the following sentence true or false? The hotter a radiating body is, the longer the wavelengths of maximum radiation it will produce. ________________

9. ☐ Objects that are good absorbers of radiation are also good ________________ of radiation.

What Happens to Solar Radiation?

10. ☐ List three things that can happen when radiation strikes an object. __________________________________________

11. Circle the letter of the process that produces rays that travel in all directions.
   a. absorption
   b. transmission
   c. reflection
   d. scattering

12. About ________________ percent of the solar energy reaching the outer atmosphere is reflected or scattered back into space.

13. What is the greenhouse effect? __________________________________________

14. Is the following sentence true or false? Another term for the greenhouse effect is global warming. ________________
Section 17.3 Temperature Controls

This section describes the factors that influence temperature and discusses worldwide temperature distribution.

Reading Strategy

Previewing Before you read, use Figure 15 to describe the temperature variations for Vancouver and Winnipeg. 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>Temperature Variations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vancouver</td>
</tr>
<tr>
<td>Winnipeg</td>
</tr>
</tbody>
</table>

Why Temperatures Vary

1. List five factors other than latitude that exert a strong influence on temperature.

   ____________________________
   ____________________________
   ____________________________

Match each location with its effect on temperature. You may use some effects more than once.

<table>
<thead>
<tr>
<th>Location</th>
<th>Effect on Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. windward of a large body of water</td>
<td>a. lower temperatures</td>
</tr>
<tr>
<td>3. at a low altitude</td>
<td>b. higher temperatures</td>
</tr>
<tr>
<td>4. on a leeward coast</td>
<td>c. more moderate temperatures</td>
</tr>
<tr>
<td>5. behind a mountain range</td>
<td>d. less moderate temperatures</td>
</tr>
<tr>
<td>6. at a high altitude</td>
<td></td>
</tr>
</tbody>
</table>

7. Circle the letter of the sentence that is true.
   a. Land heats more rapidly and cools more slowly than water.
   b. Land heats more rapidly and cools more rapidly than water.
   c. Land heats more slowly and cools more slowly than water.
   d. Land heats more slowly and cools more rapidly than water.
Chapter 17  The Atmosphere: Structure and Temperature

8. Why does the Southern Hemisphere have smaller annual temperature variations than the Northern Hemisphere?

9. Is the following sentence true or false? A location on a windward coast will have a more moderate climate than an inland location at the same latitude.

10. Mountains can affect temperatures by acting as

11. How does altitude affect mean temperature?

12. Circle the letter of the correct definition of \textit{albedo}.
   a. line that connects points with the same temperature
   b. fraction of total radiation reflected by a surface
   c. trapping of heat in Earth's atmosphere
   d. transfer of heat by movement within a substance

13. What effect do clouds have on incoming solar radiation?

14. Is the following sentence true or false? Clouds have the same effect on temperatures during the night as they do during the day.

\textbf{World Distribution of Temperature}

15. Circle the letter of the lines on a map that connect points with the same temperature.
   a. albedos
   b. altitudes
   c. latitudes
   d. isotherms

16. What general trend does a world isothermal map show?
Chapter 17  The Atmosphere: Structure and Temperature

WordWise

Complete the sentences by using the scrambled vocabulary terms below.

oureenhgse cefett  tinrwe etolssic  thae
stohopperre  msrtheiso  psorseheme
gsirmp oenuixq  lauaumtn nexuiqo  nzoeo
mtheosperhe  rremeauettp  nsatecrig
msmeur sscotile  oonunctdi  elodba
oraiatnd  pssrarorhtee  vococentin

The _____________ is the bottom layer of the atmosphere.
Many clouds reflect a lot of sunlight because they have a high _____________.
Temperatures decrease in the third layer of the atmosphere, the _____________.
The ____________ contains only a tiny fraction of the atmosphere’s mass.
The ____________ is the first day of summer.
In the Northern Hemisphere, the ____________ occurs on September 22 or 23.
_______________ is a form of oxygen with three oxygen atoms in each molecule.
Solar energy reaches Earth by _____________.
March 21 or 22 is the _____________ in the Northern Hemisphere.
_______________ is the energy transferred from one object to another due to a difference in their temperatures.
The average kinetic energy of the atoms or molecules in a substance is its _____________.
The ozone layer is found in the _____________.
When you touch a hot metal spoon, you experience heat transferred by _____________.
The lines on a world isothermal map are called _____________.
Water being heated in a pan circulates because of _____________.
Light reaches areas that are not in direct light by means of _____________.
Winter begins on the _____________.
The ____________ keeps Earth warm enough to be a suitable habitat for living things.