Layers of the Atmosphere

This section describes the four main layers of the atmosphere.

Use Target Reading Skills

As you preview Figure 9 in your textbook, write questions in the appropriate spaces in the graphic organizer. As you read, fill in the answers under the questions.

Layers of the Atmosphere

Q. Where is the ozone layer?
A.
Q.
A.

Introduction

1. The four main layers of the atmosphere are classified according to changes in _____.

The Troposphere

2. Circle the letter of each sentence that is true about the troposphere.

a. It is the lowest layer of Earth's atmosphere.
b. It has less variable conditions than other layers.
c. It is where Earth's weather occurs.
d. It is the shallowest layer of the atmosphere.

3. Is the following sentence true or false? The troposphere contains almost all of the mass of the atmosphere. _____

4. Is the following sentence true or false? As altitude increases in the troposphere, temperature also increases. _____

Layers of the Atmosphere *(continued)*

5. How does the depth of the troposphere vary?

_____

_____

_____

6. Is the following sentence true or false? At the top of the troposphere, the temperature stops decreasing. _____

The Stratosphere

7. How far does the stratosphere extend above Earth's surface?

_____

_____

8. Circle the letter of each sentence that is true about the stratosphere.

a. The temperature of the lower stratosphere is about –60°C.
b. The upper stratosphere is colder than the lower stratosphere.
c. The middle portion of the stratosphere contains a layer of ozone.
d. The ozone in the stratosphere reflects energy from the sun.

The Mesosphere

9. Where does the mesosphere begin?

_____

_____

10. Circle the letter of each sentence that is true about the mesosphere.

a. It contains the ozone layer.
b. It contains the coldest part of the atmosphere.
c. It protects Earth's surface from being hit by most meteoroids.
d. It ends at 320 kilometers above sea level.

The Thermosphere

11. Circle the letter of each sentence that is true about the thermosphere.

a. It is the outermost layer of the atmosphere.
b. Its air is very thin.
c. It has no definite outer limit.
d. It starts at 320 kilometers above sea level.

12. Why is the thermosphere so hot?

_____

_____

_____

_____

_____

13. Why would an ordinary thermometer show a low temperature in the thermosphere?

_____

_____

_____

_____

14. List the layers of the thermosphere, and describe where each begins above Earth's surface.

a. _____

b. _____

15. Brilliant light displays that occur in the ionosphere are called the _____.

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Layers of the Atmosphere

Key Concepts

- What are the four main layers of the atmosphere?
- What are the characteristics of each layer?

As you rise up through the atmosphere, air pressure and temperature change dramatically. **Scientists divide Earth's atmosphere into four main layers classified according to changes in temperature. These layers are the troposphere, the stratosphere, the mesosphere, and the thermosphere.**

You live in the inner, or lowest layer of Earth's atmosphere, the **troposphere. The troposphere is the layer of the atmosphere in which Earth's weather occurs.** The depth of the troposphere varies from 16 kilometers above the equator to less than 9 kilometers above the North and South Poles.

The **stratosphere** extends from the top of the troposphere to about 50 kilometers above Earth's surface. **The stratosphere is the second layer of the atmosphere and contains the ozone layer.** The ozone layer is important because it protects Earth's living things from dangerous ultraviolet radiation from the sun.

Above the stratosphere, a drop in temperature marks the beginning of the next layer, the **mesosphere.** The mesosphere begins 50 kilometers above Earth's surface and ends at an altitude of 80 kilometers. **The mesosphere is the layer of the atmosphere that protects Earth's surface from being hit by most meteoroids.**

The outmost layer of Earth's atmosphere is the thermosphere. The **thermosphere** extends from 80 kilometers above Earth's surface outward into space. It has no definite outer limit, but blends gradually with outer space.

The thermosphere is divided into two layers. The lower layer, called the **ionosphere,** begins about 80 kilometers above the surface and extends to about 400 kilometers. Gas molecules here are electrically charged because of the sun's energy. Radio waves bounce back from the ionosphere to Earth's surface. The brilliant light displays called auroras also occur in the ionosphere. The outer layer of the thermosphere is the **exosphere.**

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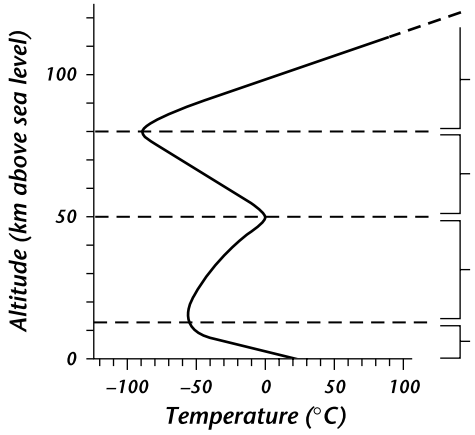
Layers of the Atmosphere

Understanding Main Ideas

The graph below shows altitudes and temperatures for the four main layers of the atmosphere. Label the four layers, and then complete the statements that follow.



1. _____

2. _____

3. _____

4. _____

5. The temperature in the atmosphere approaches –90°C at an altitude of about _____.

6. The highest temperatures in the atmosphere occur in the _____.

7. Temperatures generally rise as altitude increases in the _____ and _____ layers of the atmosphere.

8. As you move up through the mesosphere, the temperature _____.

Building Vocabulary

If the statement is true, write true. *If it is false, change the underlined word or words to make the statement true.*

_____ **9.** The layer of the atmosphere where weather occurs is the thermosphere.

_____ **10.** The mesosphere is the layer of the atmosphere that contains ozone.

_____ **11.** The exosphere is the outer layer of the thermosphere.

_____ **12.** Most meteoroids burn up in the stratosphere.

_____ **13.** The troposphere is divided into the ionosphere and the exosphere.

_____ **14.** The ionosphere lies between the mesosphere and exosphere.

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Air Pressure in the Troposphere

Earth's weather occurs in the troposphere, and air pressure is an important factor in weather. Use the data on air pressure in the table to make a graph showing how air pressure changes as you move upward in the troposphere.

Altitude (m above sea level)	Average Air Pressure (millibars)
0 (sea level)	1013.2
500	954.6
1,000	898.8
1,500	845.6
2,000	795.0
2,500	746.9
3,000	701.2
3,500	657.8
4,000	616.6
4,500	577.5
5,000	540.5
5,500	505.4
6,000	472.2
6,500	440.8
7,000	411.0
7,500	383.0
8,000	356.5
8,500	331.5
9,000	308.0
9,500	285.8
10,000	265.0

Answer the following items on a separate sheet of paper.

1. Describe the relationship between altitude and air pressure shown in the graph.
2. Estimate the average air pressure in a hole 500 meters below sea level.
3. If you were flying in a plane at an altitude of 1,500 meters, what would the air pressure outside the plane be? When you fly that high, why might your ears "pop"?