Name _____ Date _____ Class _____

SECTION 1-4 **SECTION SUMMARY**

Layers of the Atmosphere

Guide for Reading

- **What are the characteristics of the main layers of the atmosphere?**

As you rise up through the atmosphere, air pressure and temperature change dramatically. **The four main layers of the atmosphere are classified according to changes in temperature. These layers are the troposphere, the stratosphere, the mesosphere, and the thermosphere.**

The **troposphere** is the inner, or lowest, layer of Earth's atmosphere. It extends from Earth's surface to between 9 and 16 kilometers above the surface. As altitude increases in the troposphere, the temperature decreases. At the top of the troposphere, the temperature is about -60°C. The troposphere is the shallowest layer of the atmosphere, but it contains most of the atmosphere's mass and all of Earth's weather.

The **stratosphere** extends from the top of the troposphere to about 50 kilometers above Earth's surface. The lower stratosphere is cold at about -60°C. However, the stratosphere gets warmer toward the top. This is because the upper stratosphere contains a layer of ozone, the three-atom form of oxygen. Ozone absorbs energy from the sun and converts it to heat.

The **mesosphere** is the layer of Earth's atmosphere above the stratosphere. It begins 50 kilometers above Earth's surface and extends to 80 kilometers. The top of the mesosphere is the coldest part of the atmosphere, with temperatures near -90°C. The mesosphere protects Earth's surface from most meteoroids. They burn up as they fall toward Earth through this layer of the atmosphere.

The **thermosphere** is the outermost layer of Earth's atmosphere. It extends from 80 kilometers outward into space with no definite outer limit. Gas atoms and molecules there are so far apart that the air blends gradually with outer space. The air in the thermosphere is very hot, up to 1,800°C. This is because energy coming from the sun strikes the thermosphere first. Its nitrogen and oxygen molecules convert the sun's energy into heat. The air in the thermosphere has a very low density, having just a fraction of a percent of the density of air at sea level.

The thermosphere is divided into two layers. The lower layer of the thermosphere is the **ionosphere.** 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 of the **aurora borealis,** or Northern Lights, also occur in the ionosphere. The outer layer of the thermosphere is the **exosphere.** Satellites orbit Earth in this layer. They communicate long-distance telephone and television signals and watch weather from far out in the atmosphere.