

# 11-2 What are the layers of the atmosphere?

## Objective

Name and describe the layers of the atmosphere.

## Key Terms

**troposphere** (TROH-puh-sfeer): lowest layer of the atmosphere  
**stratosphere** (STRAI-uh-sfeer): second layer of the atmosphere  
**mesosphere** (MEHZ-uh-sfeer): third layer of the atmosphere  
**thermosphere** (THER-muh-sfeer): upper layer of the atmosphere

**Parts of the Atmosphere** The atmosphere begins at Earth's surface and goes more than 700 km up. Not all parts of the atmosphere are the same. The atmosphere is made up of four main layers. These layers are the troposphere, the stratosphere, the mesosphere, and the thermosphere.

**LIST:** What are the four main layers of the atmosphere?

**The Troposphere** The troposphere is the layer of the atmosphere closest to Earth. The air you breathe into your lungs is part of the troposphere. Most of the water vapor found in the atmosphere is in the troposphere. This water vapor forms clouds. Weather takes place in the troposphere.

The higher you go in the troposphere, the colder it gets. Near the top of the troposphere, the temperature stops getting colder. The boundary between the troposphere and the layer above is called the tropopause.

**DEFINE:** What is the tropopause?

**The Stratosphere** The stratosphere is the second layer of the atmosphere. The temperature of the air remains almost constant here. There is no weather in the stratosphere. Airplanes travel in this layer.

The upper stratosphere contains a layer of ozone. Ozone is a form of oxygen. Ozone prevents most of

the ultraviolet light given off by the Sun from reaching Earth. Large amounts of ozone, however, are harmful to breathe and can irritate the lungs.

**PREDICT:** What might happen if the ozone layer of the stratosphere were destroyed?

**The Mesosphere and Thermosphere** Above the stratosphere is the third layer of the atmosphere, the **mesosphere**, which means "middle layer." In the mesosphere, temperatures begin to fall again. Above the mesosphere is the fourth region, the **thermosphere**. Here temperatures actually rise with height. Beyond the thermosphere is mostly empty space. This region is called the exosphere.

From the mesosphere up to the top of the thermosphere is a broad region of space that contains many charged particles called ions. Radio waves sent from Earth are reflected or bounced off of these ions. Because of ions, radio signals can be sent between distant parts of Earth. The area where the ions are most concentrated is called the ionosphere.

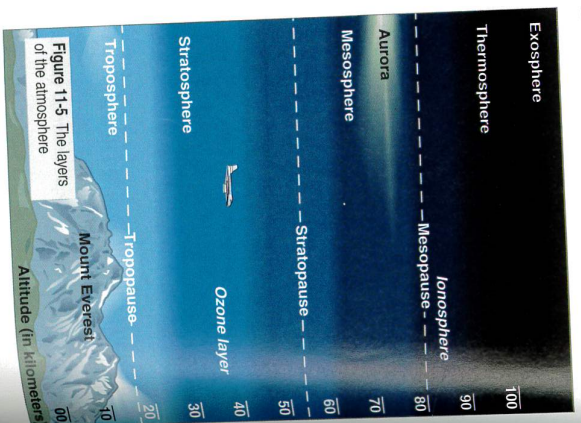


Figure 11-5 The layers of the atmosphere

Sometimes, in the night sky near the poles, you can see glowing colored light, usually green. These glowing lights, called auroras, are caused by charged particles from the Sun. The particles are interacting with matter in Earth's upper atmosphere. In the northern polar region, these events are known as the aurora borealis, or the northern lights. In the Southern Hemisphere, they are known as aurora australis.

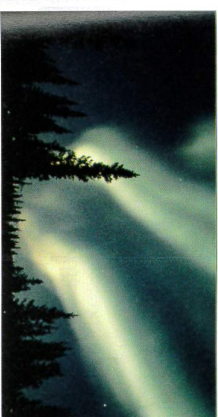


Figure 11-6 The aurora borealis lights up the northern sky at night.

**DESCRIBE:** How is the ionosphere used in communications?

## Integrating Physical Science

**TOPICS:** air pressure, force

### GETTING A LIFT INTO THE AIR

Daniel Bernoulli (bur-NOO-lee) was a Swiss scientist known for his work with fluids. Bernoulli found that the faster a fluid moves, the less pressure it exerts. Pressure is the amount of force acting on a surface. Bernoulli further stated that the pressure of a moving stream of fluid or gas is lower than the pressure of any fluid or gas around it. This explains how air moving around a wing can produce a force called lift, allowing an airplane to fly.

Objects can be designed so that air moves at different speeds around them. If the air moves faster above the object, pressure pushes the object upward.

Like a bird's wing, the top of an airplane wing is curved. Air that moves over the top of the wing must travel farther than air that moves along the bottom. The air moving over the top moves faster so its pressure is lower than the air pressure on the bottom. This difference in pressure creates the lift.

**Thinking Critically** Why are airplane wings curved on top?

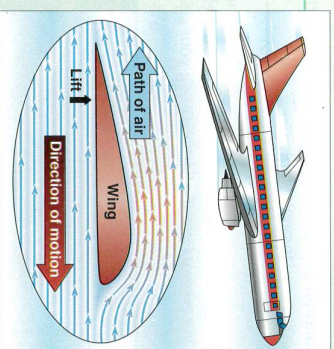


Figure 11-7 Airplane wings are curved on top, like bird wings.

## CHECKING CONCEPTS

1. The atmosphere is made up of \_\_\_\_\_ main layers.
2. The upper boundary of the troposphere is the \_\_\_\_\_.
3. Ozone is a form of \_\_\_\_\_.

## THINKING CRITICALLY

4. **INFER:** Why do most airplanes travel in the stratosphere?
5. **COMPARE:** How do air temperatures differ in the troposphere and stratosphere?

## INTERPRETING VISUALS

Use Figure 11-5 to answer the following questions.

6. **INFER:** In which layer of the atmosphere do we fly kites? Why?
7. **CALCULATE:** About how thick is the troposphere?
8. **CALCULATE:** About how thick is the troposphere?