# Chapter 15 – The Atmosphere

## Section 1

### Objectives

- **Describe** the composition of Earth's atmosphere.
- Explain why air pressure changes with altitude.
- Explain how air temperature changes with atmospheric composition.
- **Describe** the layers of the atmosphere.

### The Composition of the Atmosphere

- Nitrogen = \_\_\_\_%
- Oxygen = \_\_\_\_%
- Argon, Carbon Dioxide, Water Vapor, and others = 1%

### **Atmospheric Pressure and Temperature**

• The atmosphere is held around the Earth by \_\_\_\_\_. Gravity pulls gas molecules in the

atmosphere toward the Earth's surface, causing \_\_\_\_\_\_.

- As altitude increases, air pressure \_\_\_\_\_.
- Air temperature decreases as altitude \_\_\_\_\_.
  - \_\_\_\_\_ parts of the atmosphere are warmer because they contain a high percentage of

### Layers of the Atmosphere

- **The Troposphere: The Layer in Which We Live** The \_\_\_\_\_\_ layer of the atmosphere, which lies next to the Earth's surface, is called the troposphere.
- **The Stratosphere: Home of the Ozone Layer** The atmospheric layer above the troposphere is called the stratosphere.
- The Mesosphere: The Middle Layer The mesosphere is the middle layer of the atmosphere. It is also the

\_\_\_\_\_layer.

- The Thermosphere: The Edge of the Atmosphere The \_\_\_\_\_\_ atmospheric layer is called the thermosphere.
- The Ionosphere: Home of the Auroras In the upper mesosphere and the lower thermosphere, nitrogen

and oxygen atoms absorb harmful \_\_\_\_\_\_. This area is called the ionosphere.

### Section 2

Objectives

- **Describe** what happens to solar energy that reaches Earth.
- Summarize the processes of radiation, thermal conduction, and convection.
- **Explain** the relationship between the greenhouse effect and global warming.

#### **Energy in the Atmosphere**

• **Radiation:** The Earth receives energy from the \_\_\_\_\_ by radiation. Radiation is the transfer of energy

as \_\_\_\_\_\_ waves.

- Conduction: Thermal conduction is the transfer of thermal energy through a \_\_\_\_\_\_ material.
- Convection: Convection is the transfer of thermal energy by the circulation or movement of a \_\_\_\_\_\_

or \_\_\_\_\_.

• The Greenhouse Effect and Life on Earth The greenhouse effect is the process by which gases in the

atmosphere \_\_\_\_\_\_ thermal energy and \_\_\_\_\_\_ it back to Earth.

- Greenhouse Gases and Global Warming Some scientists think that an \_\_\_\_\_\_ of greenhouse gases in the atmosphere may be the \_\_\_\_\_\_ of global warming.
- The Radiation Balance: Energy In, Energy Out The amount of energy Earth \_\_\_\_\_\_ and the

amount of energy \_\_\_\_\_ must be approximately equal.

### Section 3

Objectives

- **Explain** the relationship between air pressure and wind direction.
- **Describe** global wind patterns.
- **Explain** the causes of local wind patterns.

Why Air Moves

• Air Rises at the \_\_\_\_\_ and Sinks at the \_\_\_\_\_ As the cold air sinks, it creates areas of

\_\_\_\_\_\_ pessure around the poles. This cold polar air then flows toward the equator.

- Pressure Belts Are Found Every \_\_\_\_\_ Convection cells are separated by \_\_\_\_\_,
  bands of high and low pressure.
- **The Coriolis Effect** The apparent \_\_\_\_\_\_ of the path of currents due to the Earth's rotation is called the Coriolis effect.

### **Global Winds**

- **Polar Easterlies** are the wind belts that extend from the poles to \_\_\_\_\_\_° latitude in both hemispheres.
- Westerlies are the wind belts found between \_\_\_\_\_° and \_\_\_\_\_° latitude in both hemispheres.
- **Trade Winds** are the winds that blow from \_\_\_\_\_° latitude almost to the \_\_\_\_\_\_ in both hemispheres.
- **The Doldrums** The trade winds of the Northern and Southern Hemispheres meet in an area around the equator called the doldrums.
- The Horse Latitudes At about \_\_\_\_\_° north and \_\_\_\_\_° south latitude, sinking air creates an area of high pressure called the horse latitudes.

• Jet Streams are \_\_\_\_\_\_ of high-speed winds that blow in the upper \_\_\_\_\_\_ and lower stratosphere.

### Local Winds

- Local winds generally move \_\_\_\_\_\_ distances and can blow from \_\_\_\_\_\_ direction.
- Mountain and \_\_\_\_\_\_ breezes are examples of local winds caused by an area's \_\_\_\_\_\_.

\_\_\_\_\_\_ and land \_\_\_\_\_\_ are affected by temperature.

### Section 4

### **Objectives**

- Compare primary and secondary air pollution.
- **Identify** the major sources of pollution.
- **Explain** the effects of the ozone hole.
- List five effects of air pollution on the human body.
- **Identify** ways to reduce air pollution.

### **Primary Pollutants**

- Pollutants that are put \_\_\_\_\_\_ into the air by human or \_\_\_\_\_\_ activity are primary pollutants.
- Primary pollutants from human sources include carbon \_\_\_\_\_, dust, smoke, and chemicals from

\_\_\_\_\_ and other substances.

### **Secondary Pollutants**

Pollutants that form when \_\_\_\_\_\_ pollutants react with other primary pollutants or with

\_\_\_\_\_ occurring substances, such as water vapor, are **secondary pollutants.** 

• \_\_\_\_\_ is a secondary pollutant that forms when \_\_\_\_\_ and vehicle exhaust react with

\_\_\_\_\_, as shown in the next slide.

### Sources of Human-Caused Air Pollution

• Industrial Air Pollution Many industrial plants and electric power plants burn \_\_\_\_\_\_ fuels, such as

coal, to produce \_\_\_\_\_\_. Burning some types of coal without \_\_\_\_\_\_ controls can release large amounts of air pollution.

• Indoor Air Pollution Sometimes, the air \_\_\_\_\_\_ a building can be more polluted than the air

\_\_\_\_\_. Sources of indoor air pollution are shown on the next slide.

### **Acid Precipitation**

- Rain, sleet or snow that contains a high concentration of \_\_\_\_\_\_ is called **acid precipitation.**
- Acid Precipitation and Plants Acid precipitation can cause the acidity of \_\_\_\_\_\_ to increase. This

process, called *acidification*, changes the balance of a soil's chemistry and negatively affects \_\_\_\_\_\_.

• The Effects of Acid Precipitation on Forests In some areas of the world, acid precipitation has damaged large areas of forest.

• Acid Precipitation and Aquatic Ecosystems If acid precipitation increases the acidity of a \_\_\_\_\_\_ or

stream, aquatic plants, fish, and other aquatic organisms may \_\_\_\_\_.

#### The Ozone Hole

• The Earth's protective \_\_\_\_\_ layer is thinning over the \_\_\_\_\_ and Antarctic regions. These

ozone holes allow more \_\_\_\_\_\_ radiation, which damages genes and can cause skin cancer, to reach the earth's surface.

• **Cooperation to Reduce the Ozone Hole** In 1987, many nations agreed to reduce the use of \_\_\_\_\_\_, the chemicals that cause ozone depletion. Because CFCs remain active for 60 to 120 years, however, it will

take many years for the ozone layer to \_\_\_\_\_\_.

### Air Pollution and Human Health

• Short-Term Effects of air pollution, such as \_\_\_\_\_, headaches, and eye irritation can be avoided by

staying \_\_\_\_\_\_ on days when the air quality is poor.

• Long-Term Effects of air pollution, such as lung \_\_\_\_\_, are particularly dangerous because they may

not be noticed until many years after \_\_\_\_\_.

### **Cleaning up Air Pollution**

- The \_\_\_\_\_\_ sets air quality standards to protect against the effects of air pollution on human health as well as on crops, vegetation, and buildings.
- Controlling Air Pollution from Industry The Clean Air Act requires many industries to use

\_\_\_\_\_-control devices.

### **Reducing Air Pollution**

The Allowance Trading System Companies are fined for \_\_\_\_\_\_ limits and rewarded for low

-----•

• Reducing Motor Vehicle Emissions The EPA requires car makers to meet a certain standard for vehicle

\_\_\_\_\_. New technology to \_\_\_\_\_\_ emissions is under development.

• People can make choices to reduce air pollution, such as \_\_\_\_\_\_ and conserving electricity.