

Chapter 3 Notes

Section 2

Objectives

- **Describe** the composition of the Earth's atmosphere.
- **Describe** the layers of the Earth's atmosphere.
- **Explain** three mechanisms of heat transfer in Earth's atmosphere.
- **Explain** the greenhouse effect..

The Atmosphere

- The **atmosphere** is a mixture of gases that surrounds a planet, such as Earth.
- _____, oxygen, carbon dioxide, and other gases are all parts of this mixture.
- Gases can be added to and removed from the atmosphere through _____.
 - For example, animals remove oxygen when they breathe in and add carbon dioxide when they breath out.
- _____ also add gases to the atmosphere, while vehicles both add and remove gases.
- The atmosphere also insulates Earth's surface.
- This insulation slows the rate at which the Earth's surface loses heat and keeps Earth temperature at which living things can survive.

Composition of the Atmosphere

- Nitrogen makes up _____percent of the Earth's atmosphere, and enters the atmosphere when volcanoes erupt and when dead plants and animals _____.
- Oxygen is the _____ most abundant gas in the atmosphere and is primarily produced by _____.
- In addition to gases, the atmosphere contains many types of tiny, _____, or atmospheric dust.
- In addition to nitrogen and oxygen, other gases such as argon, _____, methane, and water vapor make up the rest of the atmosphere.

Air Pressure

- Earth's atmosphere is pulled toward Earth's surface by _____ and as a result, the atmosphere is _____ near the Earth's surface.
- Almost the entire mass of Earth's atmospheric gases is located within _____ km of the surface.
- Air also becomes less dense with elevation, so _____ at higher elevations is more difficult.

Layers of the Atmosphere

- The atmosphere is divided into _____ layers based on _____ changes that occur at different distances above the Earth's surface.
- The Troposphere
- The Stratosphere
- The Mesosphere

- The _____

The Troposphere

- The troposphere is the _____ layer of the atmosphere in which temperature drops at a constant rate as altitude _____.
- This is the part of the atmosphere where _____ conditions exist.
- The troposphere is Earth's densest atmospheric layer and extends to _____ km above Earth's surface.

The Stratosphere

- The **stratosphere** is the layer of the atmosphere that lies immediately above the troposphere and extends from about _____ to _____ km above the Earth's surface.
- Temperature _____ as altitude increases because ozone in the stratosphere absorbs the sun's ultraviolet (UV) energy and warms the air.
- **Ozone** is a gas molecule that is made up of three _____ atoms.
- Almost all of the ozone in the atmosphere is concentrated in the stratosphere.
- Because ozone _____ UV radiation, it reduces the amount of UV radiation that reaches the Earth. UV radiation that does reach Earth can damage _____.

The Mesosphere

- The layer above the stratosphere is the mesosphere.
- This layer extends to an altitude of about _____ km.
- This is the _____ layer of the atmosphere where temperatures have been measured as low as -93°C .

The Thermosphere

- The atmospheric layer located farthest from Earth's surface is the thermosphere.
- Here, nitrogen and oxygen absorb _____ radiation resulting in temperatures measuring above _____ $^{\circ}\text{C}$.
- The air in the thermosphere is so _____ that air particles rarely collide, so little heat is transferred, and would therefore not feel hot to us.
- The absorption of X rays and gamma rays by nitrogen and oxygen causes atoms to become electrically _____.
- Electrically charged atoms are called _____, and the lower thermosphere is called the _____.

- Ions can radiate energy as _____, and these lights often glow in spectacular colors in the night skies near the Earth's North and South Poles.

Energy Transfer in the Atmosphere

- **Radiation** is the heat that is transferred as _____ waves, such as visible light and infrared waves.
- **Conduction** is the transfer of energy as heat through a solid.
- **Convection** is the movement of heat in a liquid or gas due to differences in density.

Heating of the Atmosphere

- Solar energy reaches the Earth as electromagnetic radiation, which includes visible light, infrared radiation, and ultraviolet light.
- About _____ of the solar energy that enters the atmosphere passes through it and reaches the Earth's surface, while the rest of the energy is absorbed or reflected in the atmosphere by _____, gases, and dust or it is reflected by Earth's surface.
- The Earth does not continue to get warmer because the oceans and the land _____ the absorbed energy back into the atmosphere.
- Dark-colored objects absorb more solar radiation than light-colored objects, so dark colored objects have more energy to release as _____.
- This is one reason the temperature in cities is _____ that the temperature in the surrounding countryside.

The Movement of Energy in the Atmosphere

- As a current of air, warmed by the Earth's surface, rises into the atmosphere, it begins to cool, and eventually becomes more _____ than the air around it and sinks. This current then moves back toward the Earth until it is heated and becomes less dense and then begins to rise again.
- The continual process of warm air rising and cool air sinking and moving air in a circular motion is called a _____.

The Greenhouse Effect

- The **greenhouse effect** is the warming of the surface and lower atmosphere of Earth that occurs when carbon dioxide, water vapor, and other gases in the air absorb and reradiate _____ radiation.
- Without the greenhouse effect, the Earth would be _____.
- The gases in the atmosphere that trap and radiate heat are called greenhouse gases.
- The most abundant greenhouse gases are _____, carbon dioxide, methane, and nitrous oxide, although none exist in high concentrations.
- The quantities of carbon dioxide and methane in the atmosphere vary considerably as a result of _____ and industrial processes.