



The Greenhouse Effect

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|--|---|---|
| <input type="radio"/> Sun .....A               | <input type="radio"/> Sun's Reflected Heat ..E  | <input type="radio"/> Methane .....H            |
| <input type="radio"/> Outer Space .....B       | <input type="radio"/> Sun's Absorbed Heat ....F | <input type="radio"/> Chlorofluorocarbons ....I |
| <input type="radio"/> Earth's Atmosphere ....C | <input type="radio"/> Carbon Dioxide.....G      | <input type="radio"/> Earth Heat Escaping ....J |
| <input type="radio"/> Earth .....D             |   | <input type="radio"/> Earth's Reflected Heat..K |



## Chapter 11-13: The Greenhouse Effect

In your study of the carbon cycle in an earlier plate, you saw how carbon is cycled through many aspects of the biosphere including the atmosphere, plants, animals, and microorganisms. Under ideal circumstances, the processes of carbon dioxide uptake and release from the atmosphere would operate at equal rates. Recent decades, however, have witnessed a steady, gradual increase in the carbon dioxide content in the atmosphere. This has led to a frightening phenomenon called the greenhouse effect.

This plate describes the roots of the ecological phenomenon known as the greenhouse effect. In the art, you can see the surface of the Earth, the atmosphere, which includes a cloud layer, and the ozone layer.

We will begin our discussion of the greenhouse effect with the **sun (A)**. The sun is the source of virtually all the energy that reaches Earth. Energy from the sun drives photosynthesis and travels through various trophic levels, as we explain in the plate entitled The Energy Pyramid. Energy from the sun passes through a vast expanse of **space (B)** to enter the **Earth's atmosphere (C)**. Finally, the energy reaches the surface of **Earth (D)**. Choose one color for the landmasses and a second, light color for the oceans.

We show the two possible fates of heat energy that comes from the sun. Much of it is reflected from the face of the Earth; it is shown as the **sun's reflected heat (E)**. The energy that isn't reflected is absorbed as it passes through the atmosphere to reach the Earth's surface, and is shown as the **sun's absorbed heat (F)**. This energy will pass through the various trophic levels, and both forms of energy will participate in the greenhouse effect.

We will now explore some of the gases that contribute to the greenhouse effect. Your attention should be on the three types of clouds that are shown in the plate.

Approximately 300 million years ago, during the Carboniferous period, huge quantities of carbon in the form of dead plants and animals were buried in the Earth. Time, heat, and pressure converted these carbon compounds into fossil fuels such as coal, oil, and gas. With the industrial revolution in the 1800s, the fossil fuels were burned in power plants, factories, and automobiles, and huge amounts of **carbon dioxide (G)** were released into the atmosphere. Clouds of carbon dioxide began to accumulate, causing the atmospheric content of carbon dioxide to increase by about 25%.

Another gas that contributes to the greenhouse effect is **methane (H)**. Clouds of methane are released from marshes, during the burning of forests, and from fermentation occurring in the digestive tracts of grazing animals, which is expelled as flatulence.

A third type of gas that contributes to the greenhouse effect is the **chlorofluorocarbon (I)**. Chlorofluorocarbons include industrial gases such as refrigerants, solvents, propellants, and plastic foams. Discarded and leaky units permit these gases to escape into the atmosphere.

Having identified the contributing factors, we will now see how they create the greenhouse effect. Continue your coloring as you read the text below.

In a greenhouse, glass enclosures allow sunlight to enter, and once it has entered, its energy is converted into heat. The heat is then trapped inside the greenhouse so that the temperature of the air inside increases.

The greenhouse effect works in the same way. Heat is constantly given off by the processes that occur on the Earth, and some of this **heat (J)** escapes through the cloud cover of carbon dioxide. However, much of the **heat is reflected (K)** from this increased carbon dioxide cloud cover and returns to the Earth.

Many scientists believe that the greenhouse effect may cause a rise in the average global temperature as the decades pass. They assert that the Arctic ice cap and glaciers may eventually melt, which would cause sea levels to rise and coastal wetlands to flood. The result of this decrease in the size of the continents and the cooling of the climate would be disastrous for many life forms.

### 11-13 The Greenhouse Effect

1. Under ideal circumstances, the process of carbon dioxide uptake & release would operate at \_\_\_\_\_ rates.
2. However, recent decades have witnessed a steady, gradual \_\_\_\_\_ in the carbon dioxide content in the atmosphere.
3. In what form did the huge quantities of carbon that have since been converted to fossil fuels come?
4. What converted these compounds into fossil fuels?
5. List three fossil fuels:
6. What three things burned fossil fuels & led to huge amounts of carbon dioxide being released into the atmosphere?
7. Name two sources of methane:
8. List four sources of chlorofluorocarbons:
9. In the greenhouse effect, much of the heat is reflected & returned back to Earth due to an increase in:
10. In review: what are three examples of greenhouse gases?