



Chemistry in the Atmosphere

Chapter 17



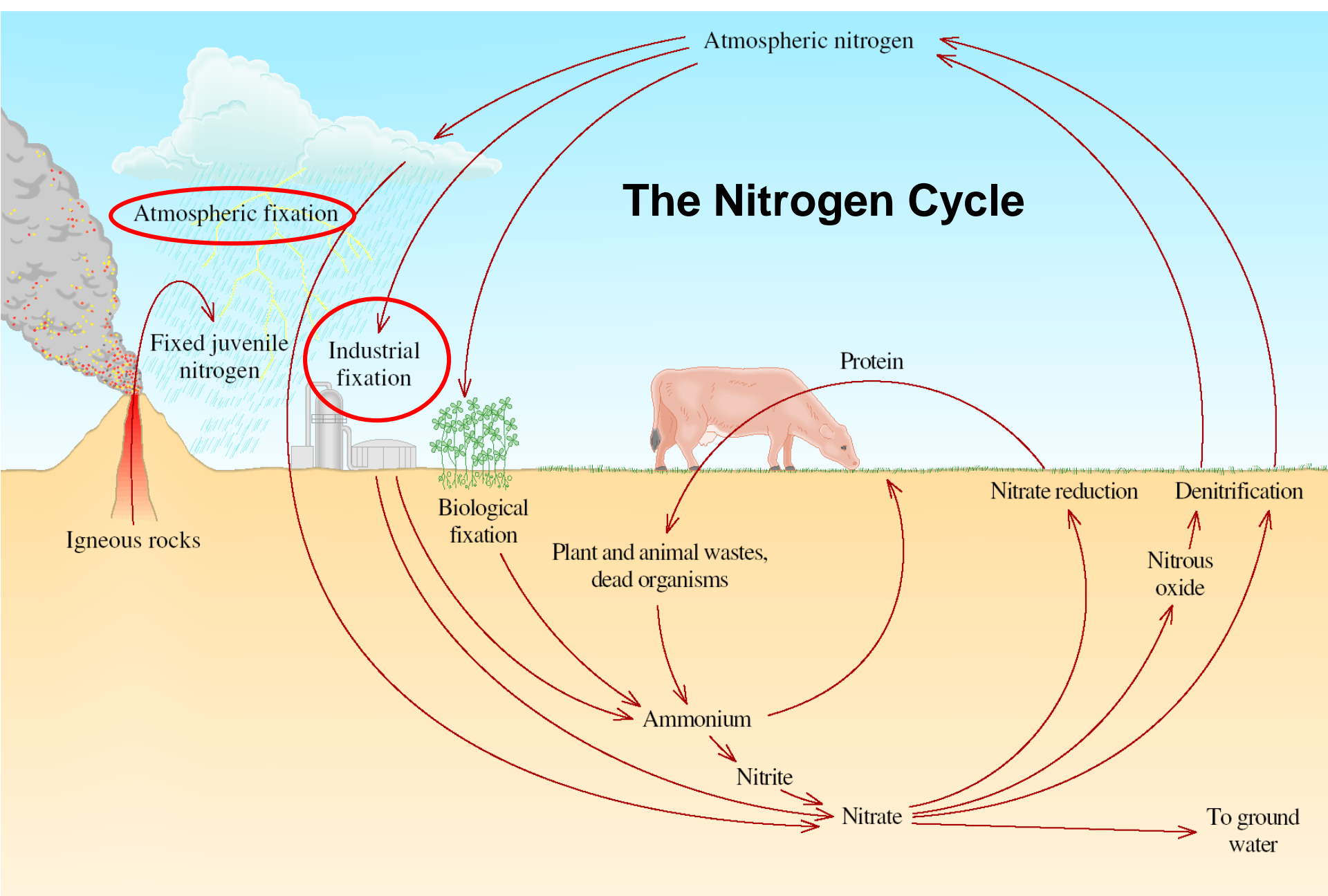
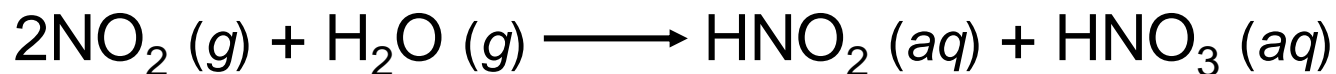
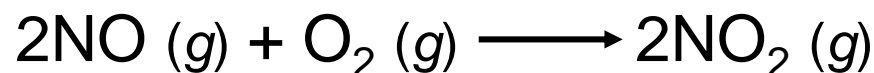
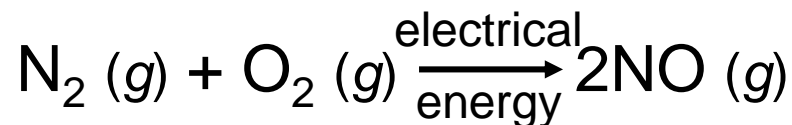


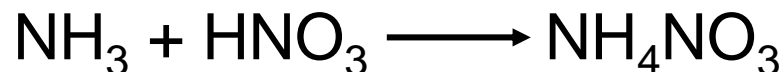
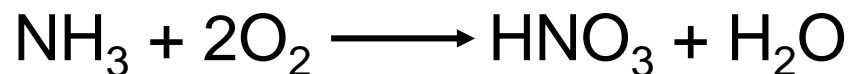
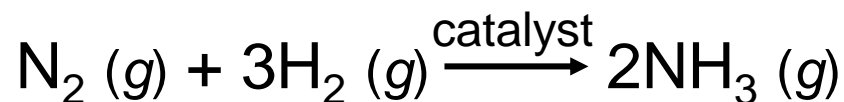
TABLE 17.1**Composition of Dry Air
at Sea Level**

| Gas | Composition (% by Volume) |
|-----------------|--------------------------------------|
| N ₂ | 78.03 |
| O ₂ | 20.99 |
| Ar | 0.94 |
| CO ₂ | 0.033 |
| Ne | 0.0015 |
| He | 0.000524 |
| Kr | 0.00014 |
| Xe | 0.000006 |

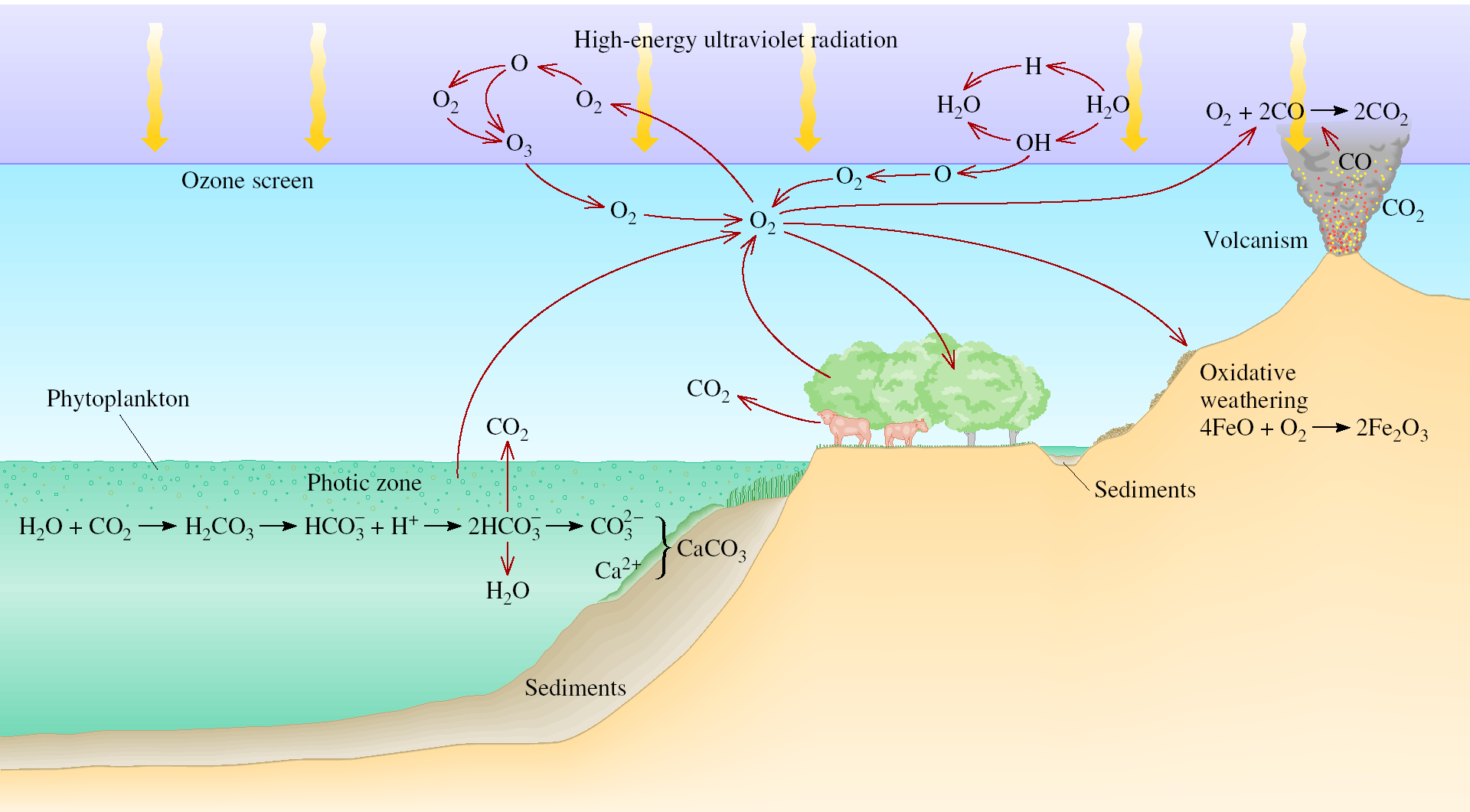
Atmospheric Nitrogen Fixation

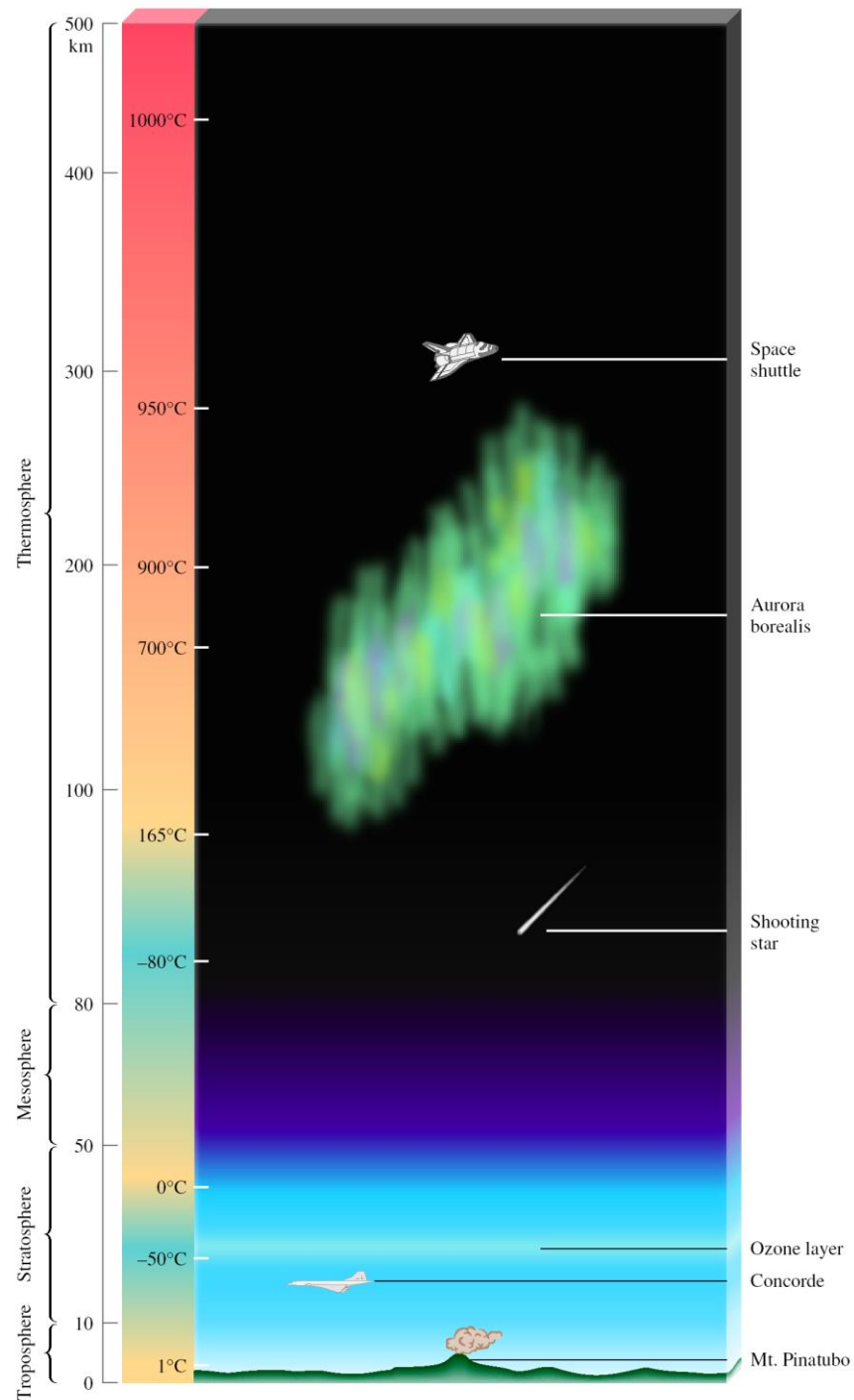
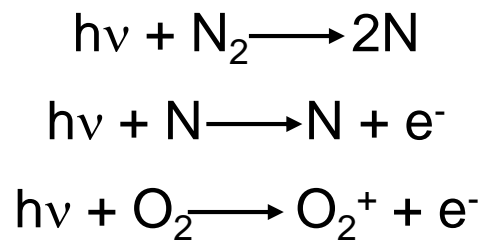


Industrial Nitrogen Fixation



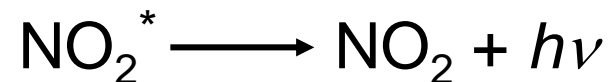
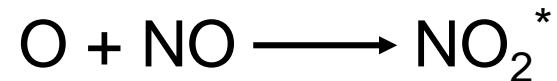
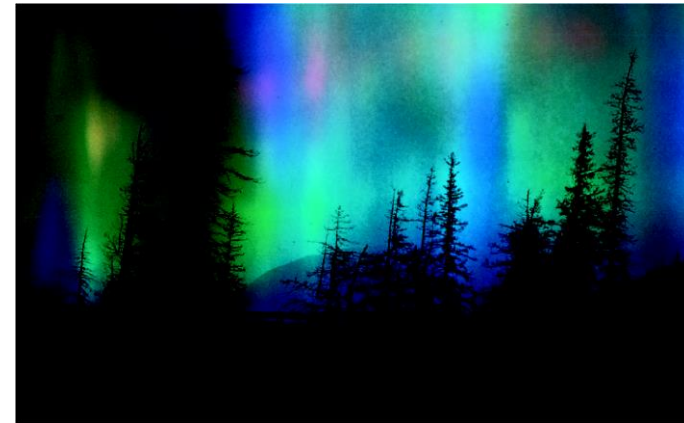
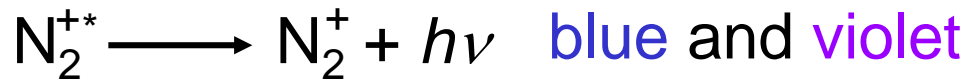
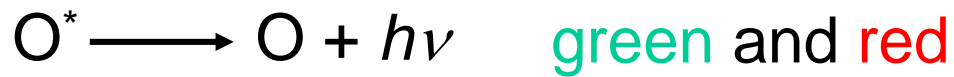
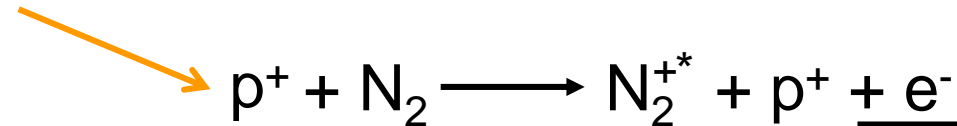
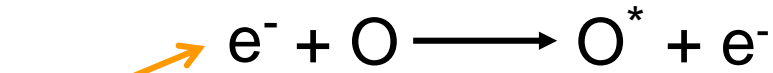
The Oxygen Cycle



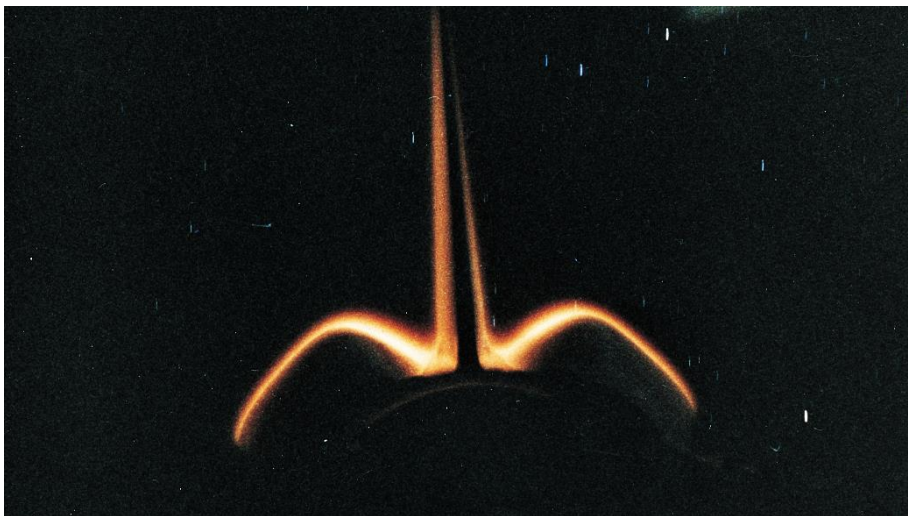


Chemical Reactions in the Thermosphere

Solar Radiation



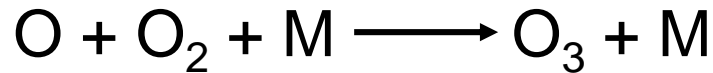
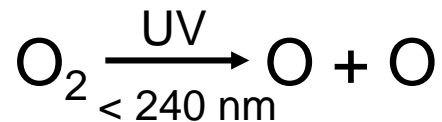
orange



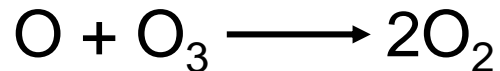
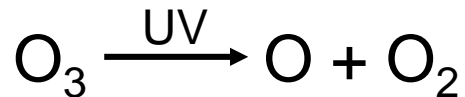
Glowing tail section of space shuttle

Depletion of Ozone in the Stratosphere

O₃ production



O₃ destruction

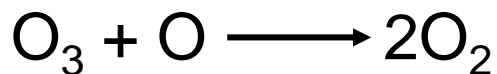
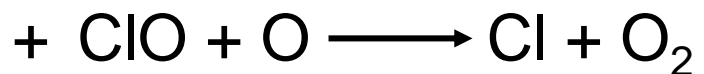
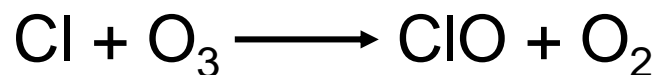
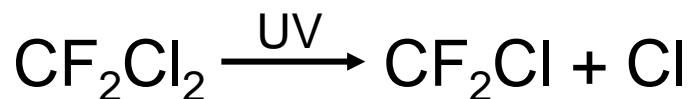
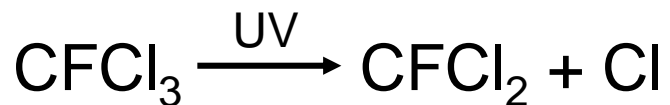


dynamic equilibrium

constant concentration
of O₃ in stratosphere

Depletion of Ozone in the Stratosphere

O₃ destruction



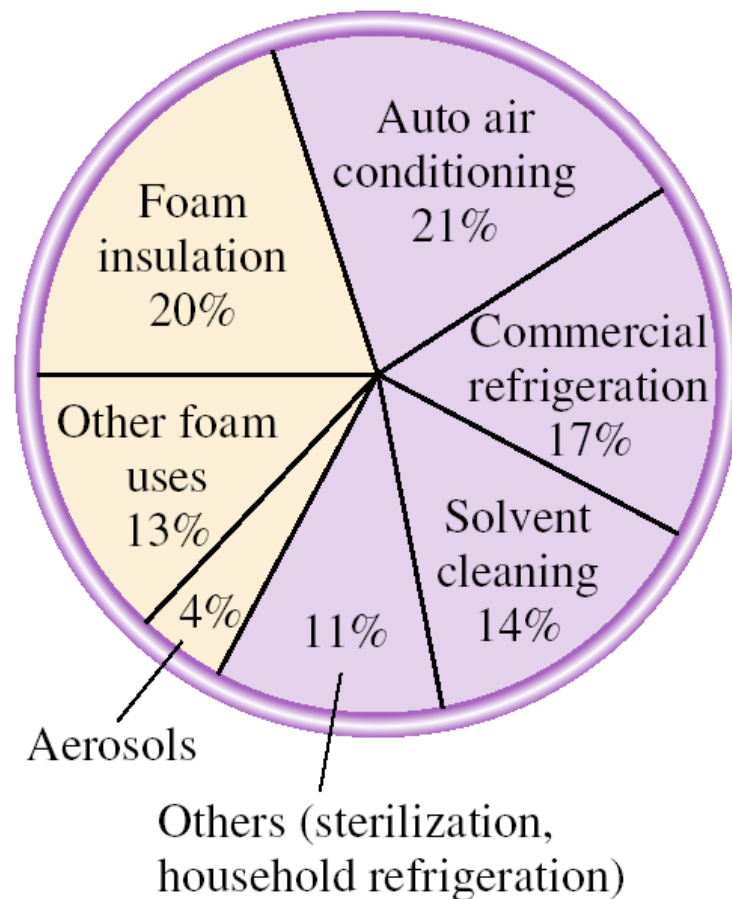
Cl catalyzes the reaction



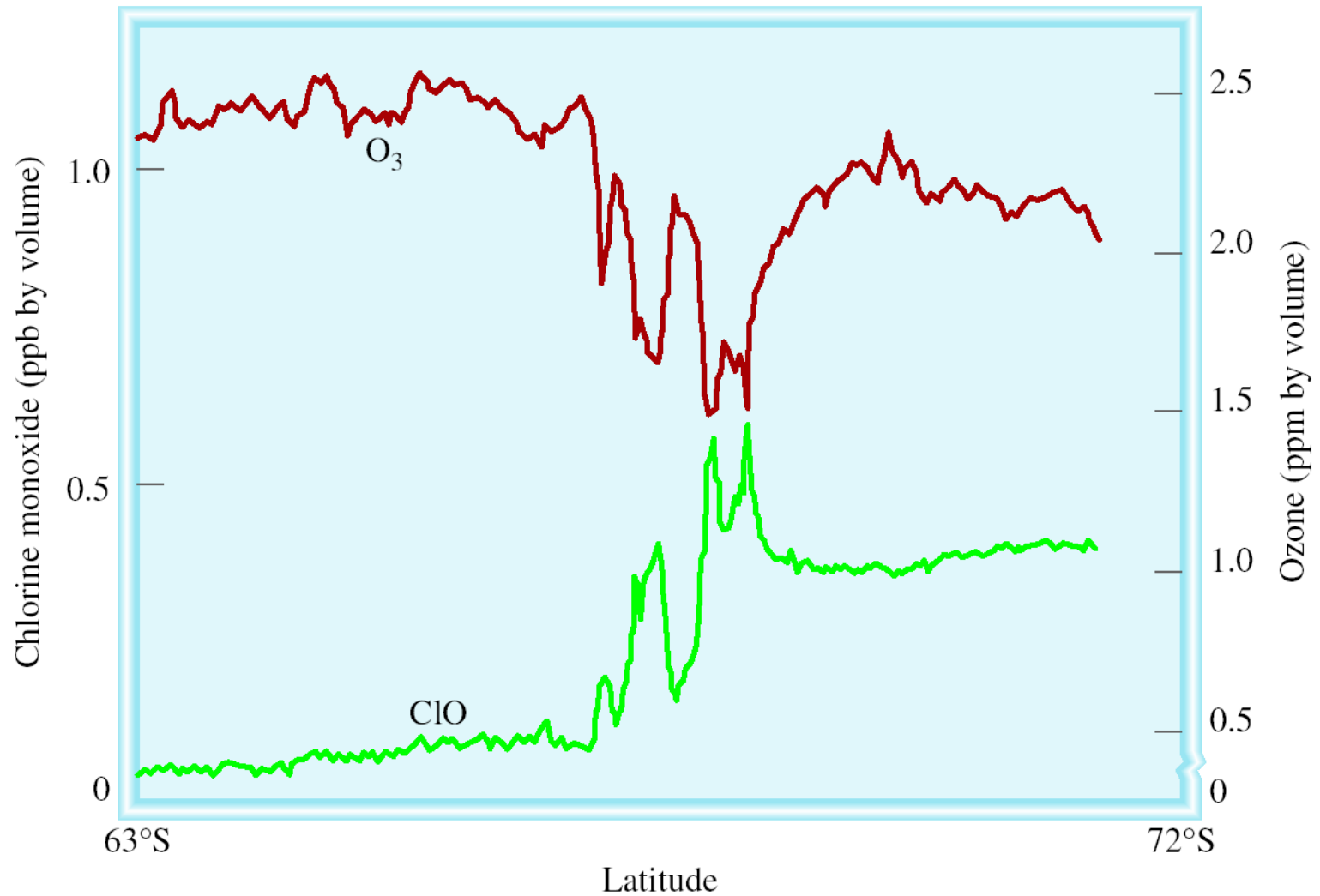
Recycling feasible



Recycling not feasible

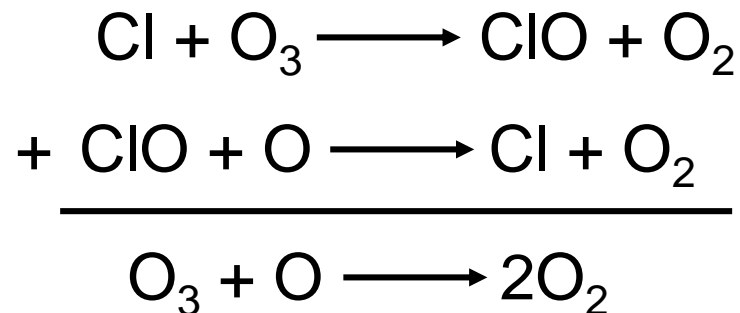


Concentrations of Chlorine Monoxide and Ozone Versus Latitude

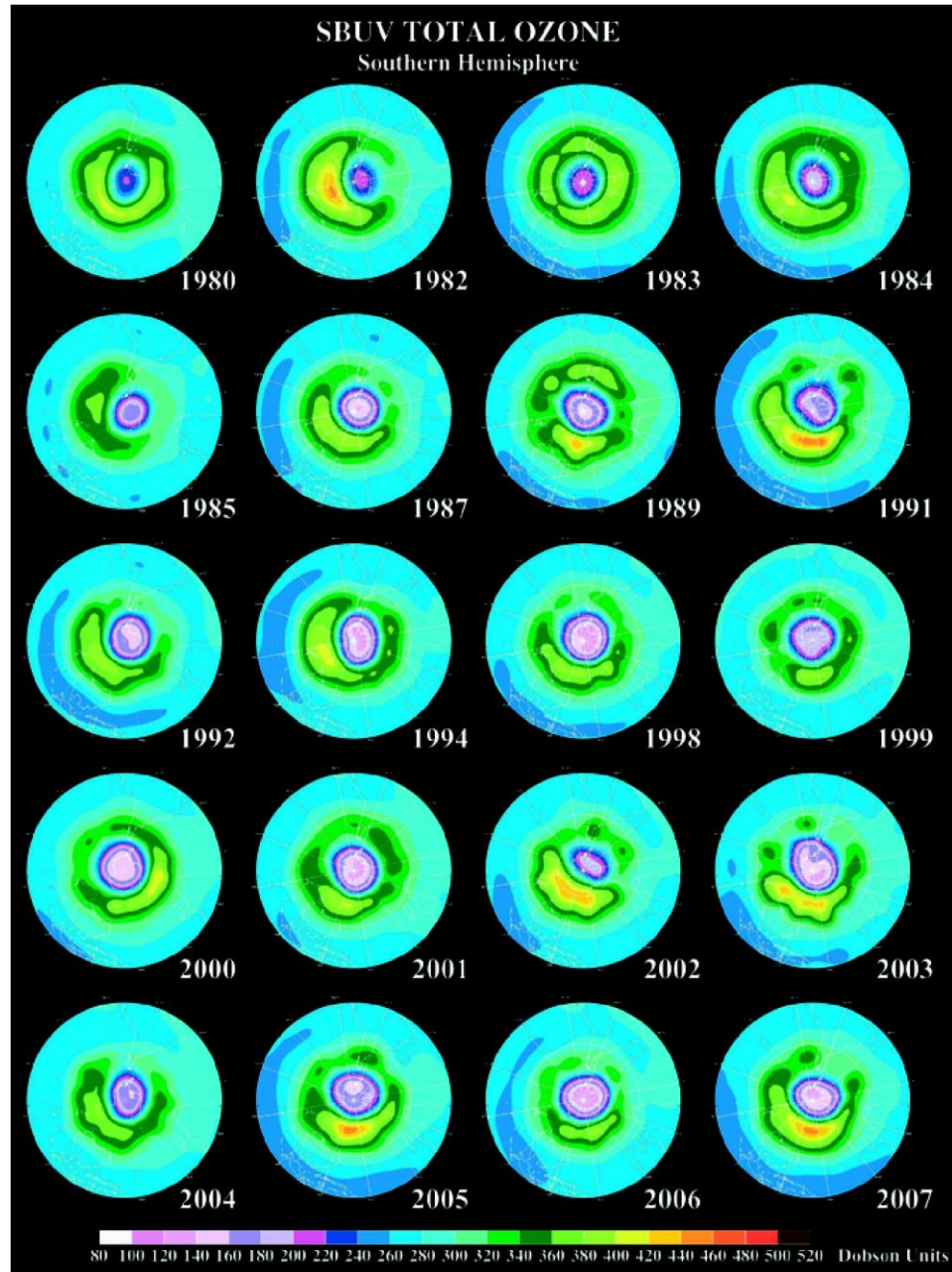


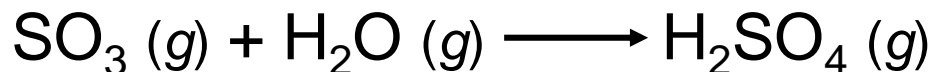
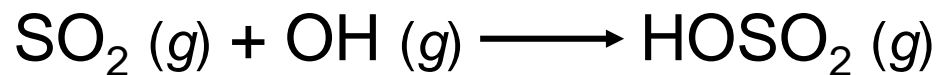


Polar stratospheric clouds provide a surface for the reaction:



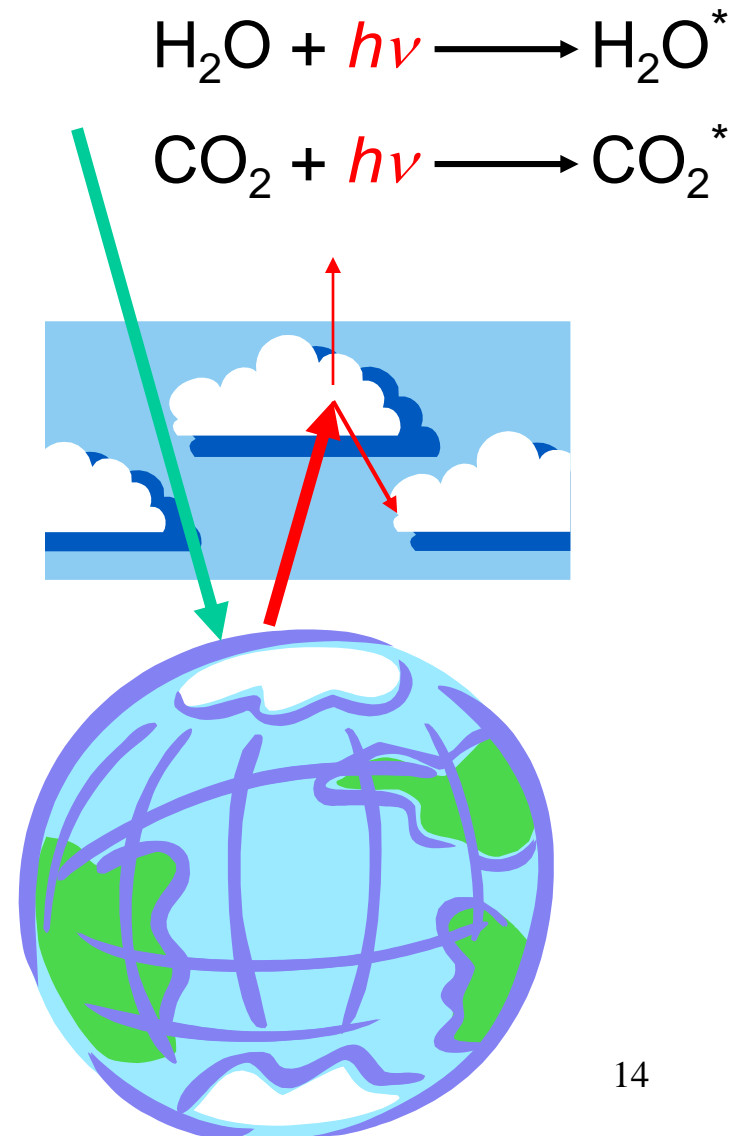
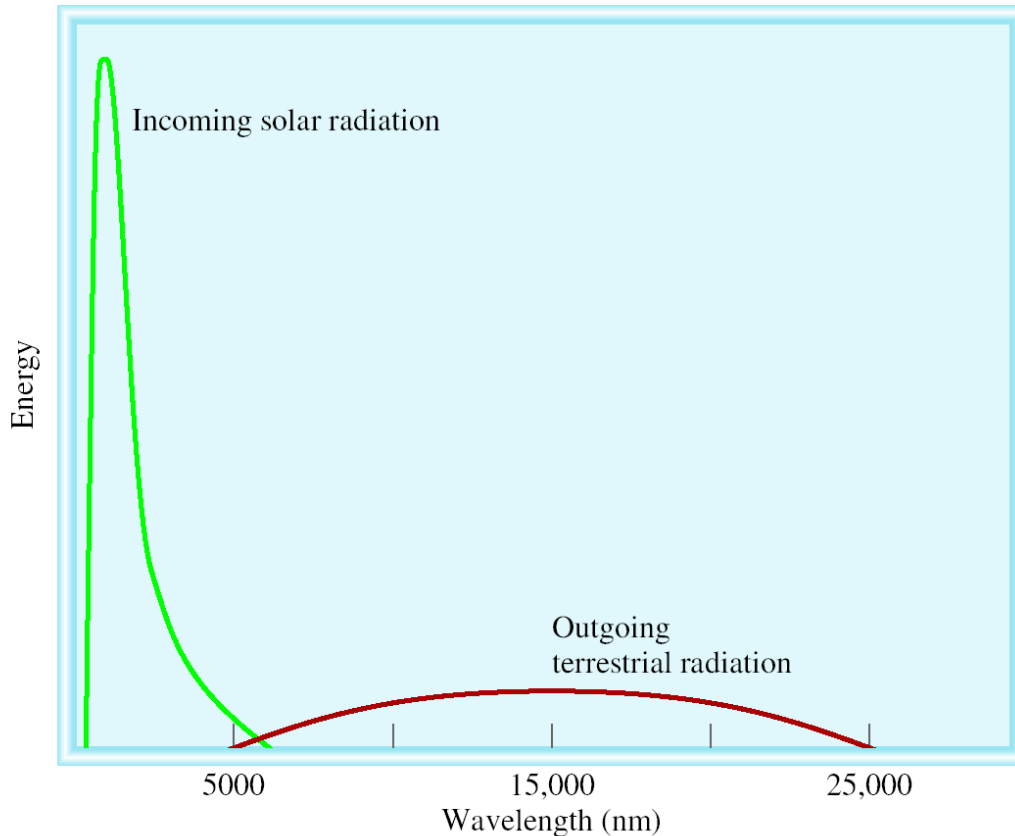
Ozone Depletion (in purple) Over the South Pole





H_2SO_4 aerosols have a **local** cooling effect on the atmosphere.

The trapping of heat near Earth's surface by gases in the atmosphere is the ***greenhouse effect***.



Why don't N_2 and O_2 contribute to the greenhouse effect ?

N_2 and O_2 cannot absorb IR radiation.

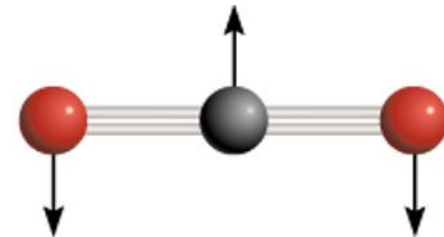
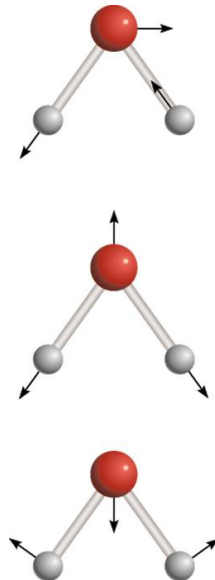
H_2O and CO_2 can absorb IR radiation.

TABLE 17.1

**Composition of Dry Air
at Sea Level**

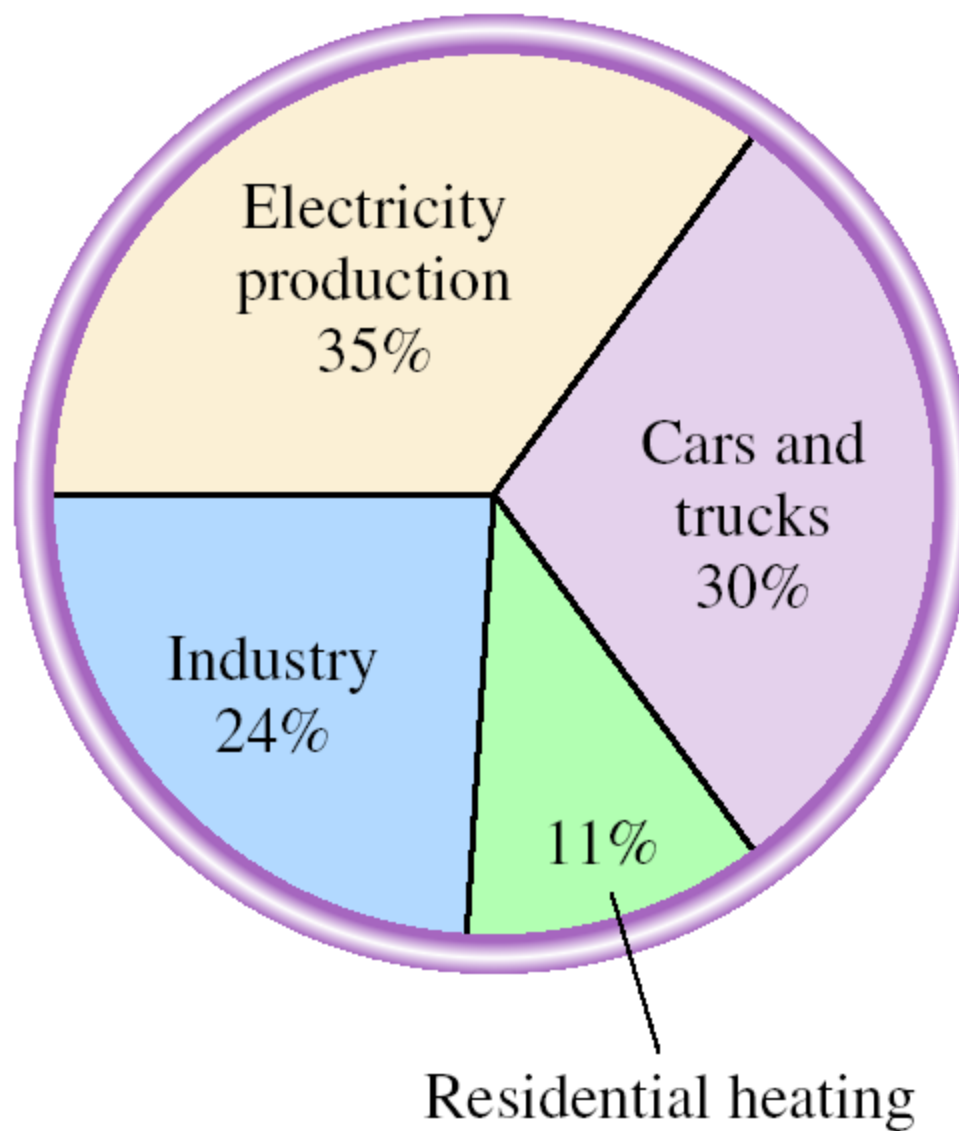
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3 vibration
modes of
 H_2O

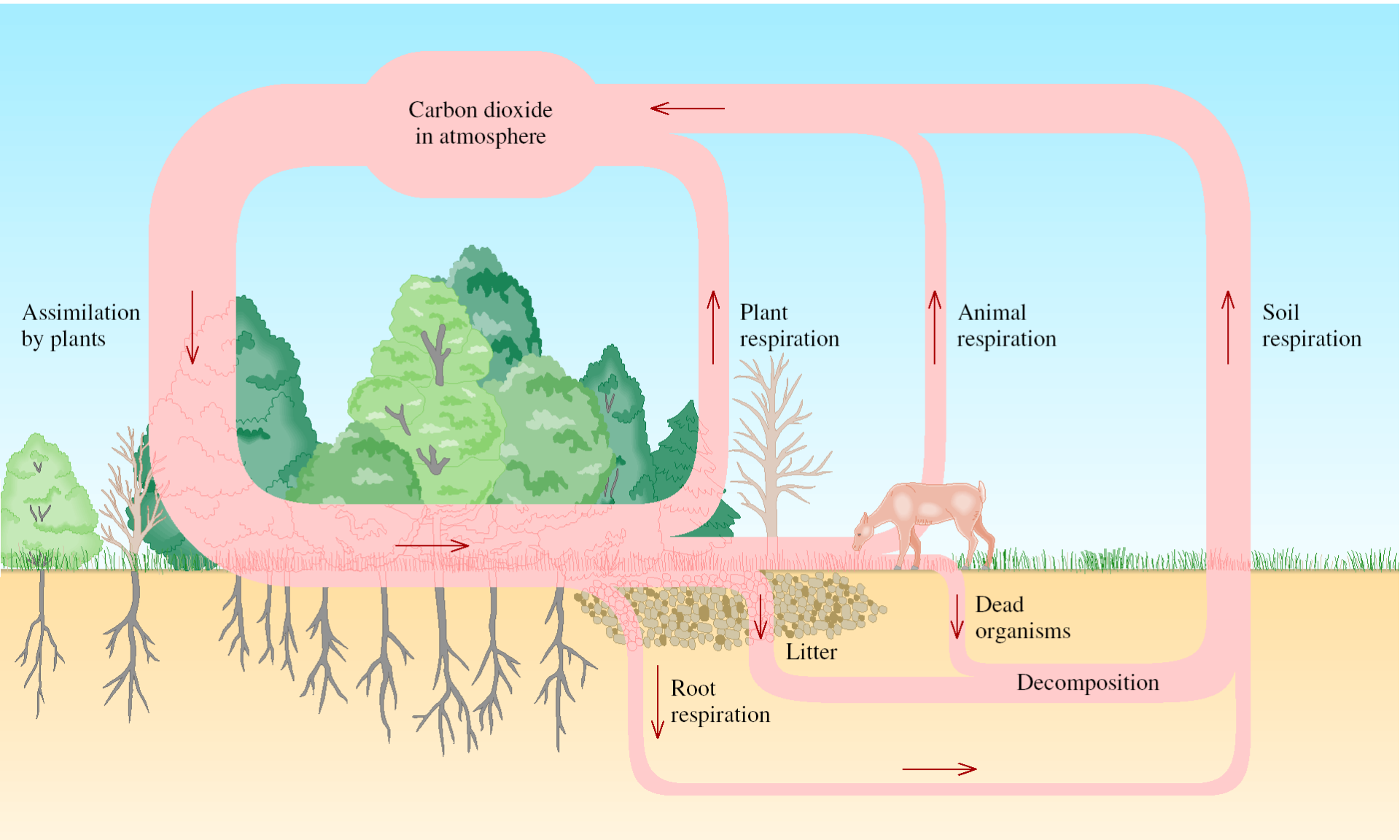


2 of the vibration modes of CO_2

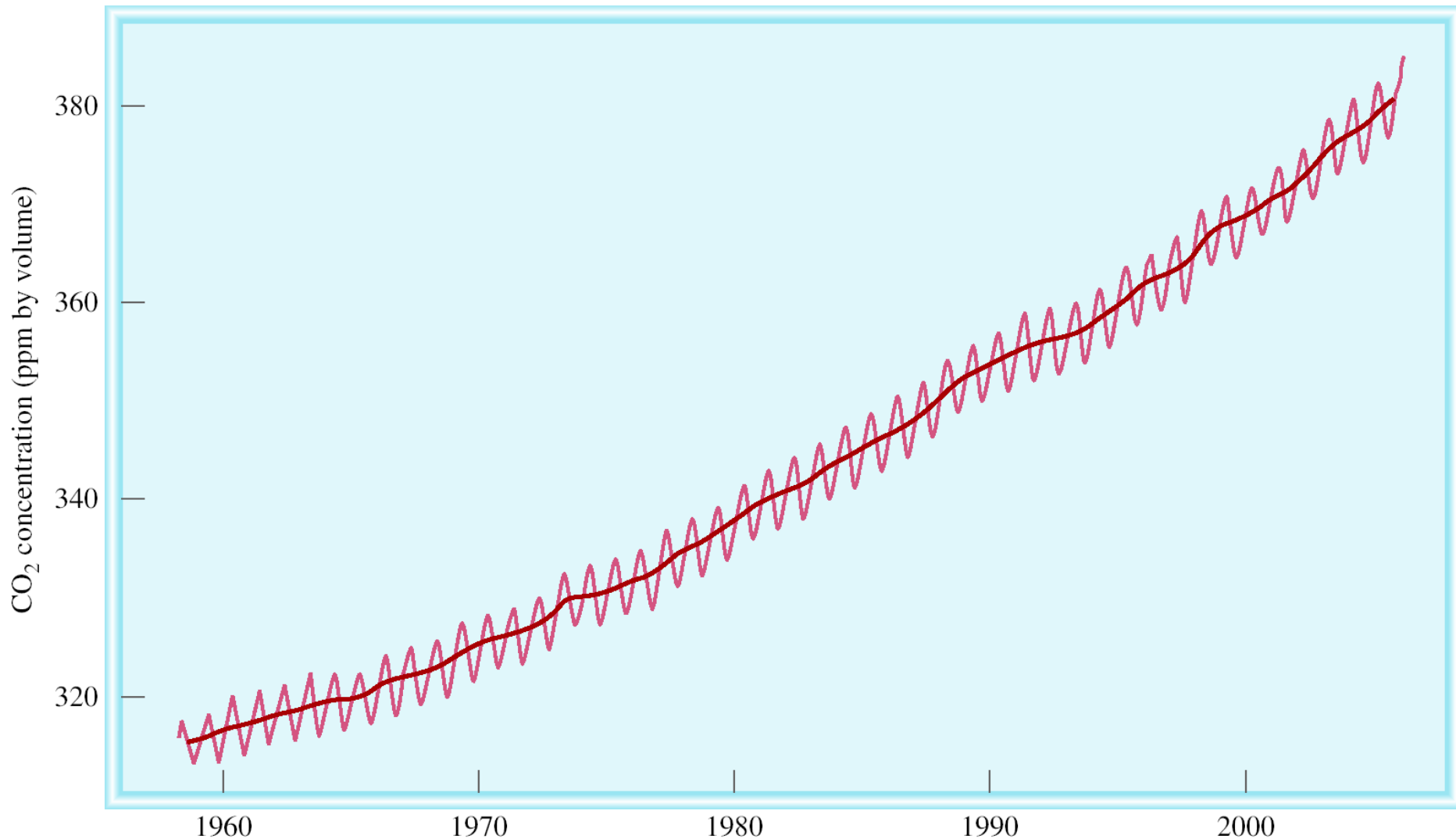
Sources of CO₂



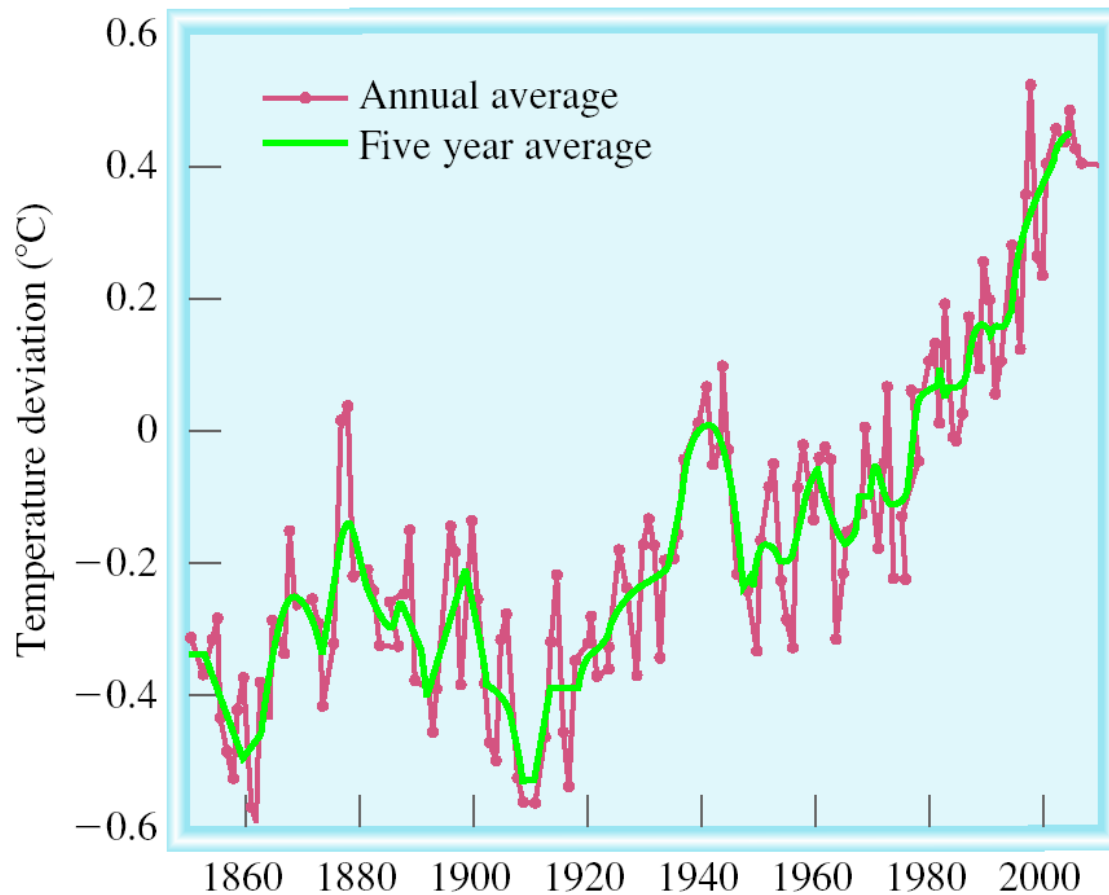
The Carbon Cycle



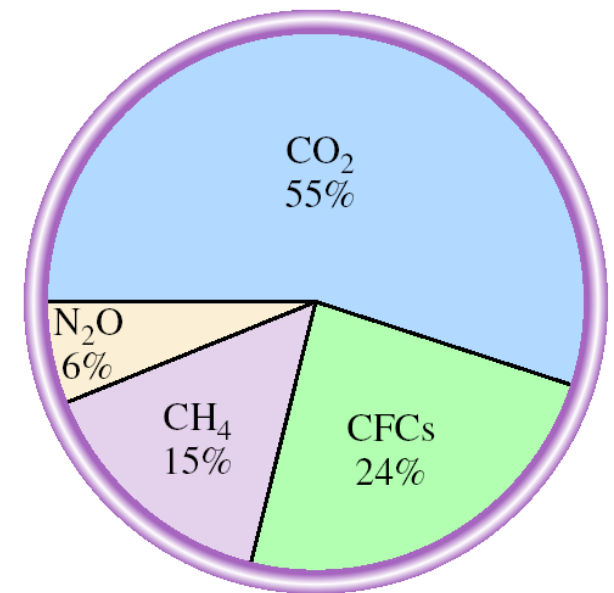
Yearly Variation of Carbon Dioxide Concentration at Mauna Loa, Hawaii.



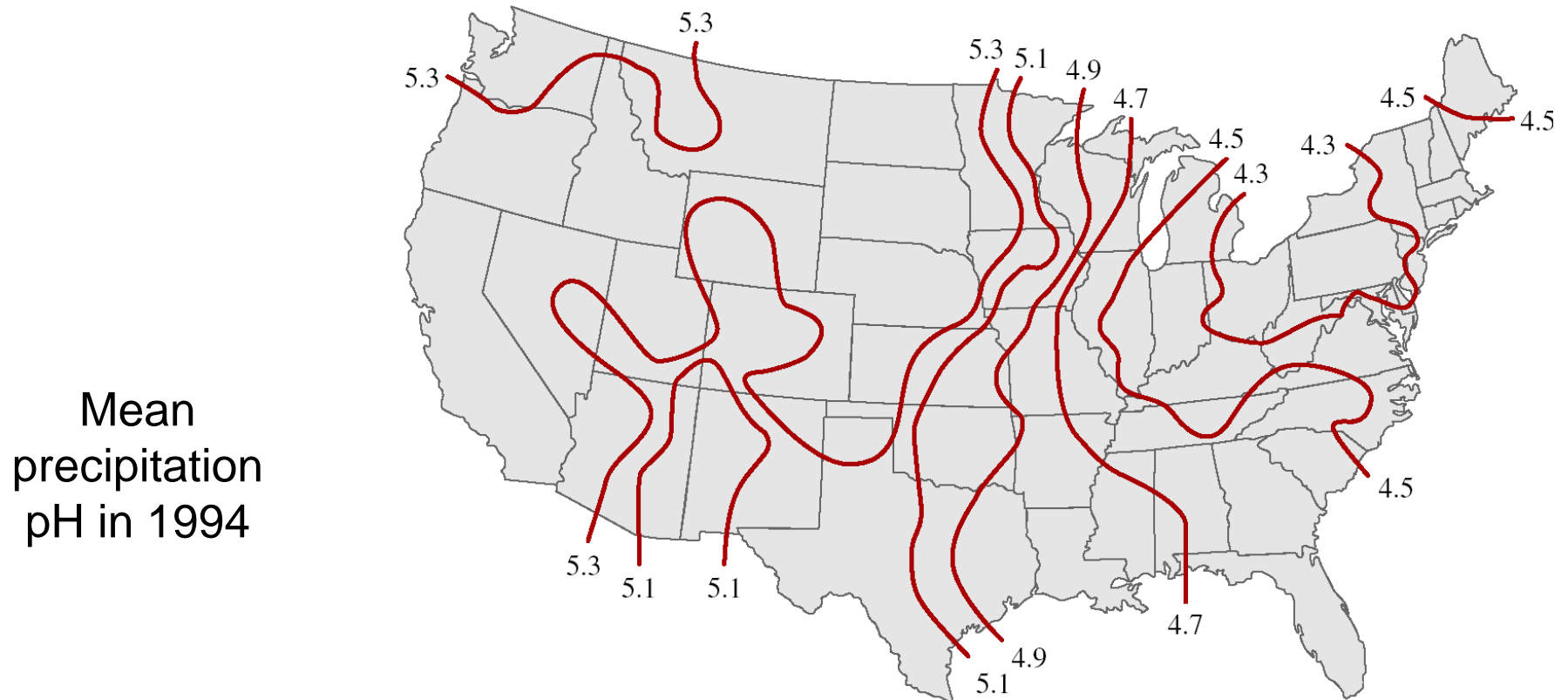
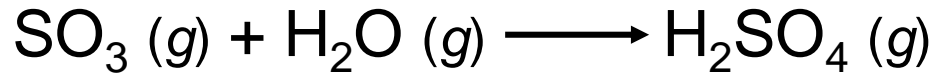
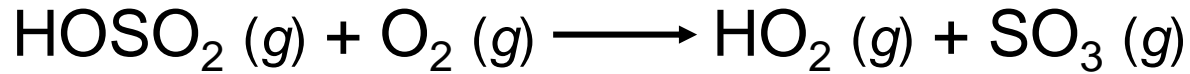
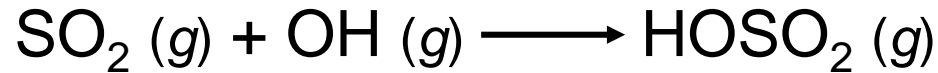
The Change in Global Temperature from 1850 to Present.

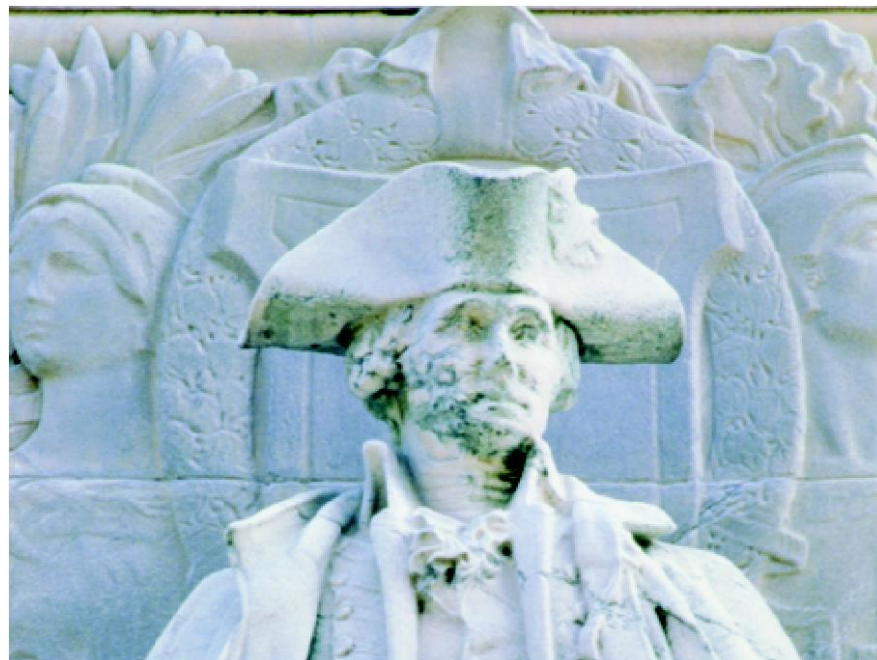
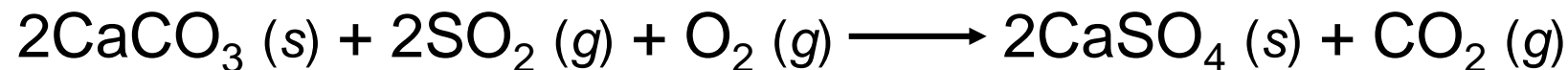
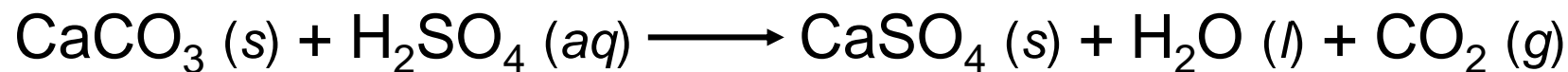


Contribution to Global Warming by Various Greenhouse Gases

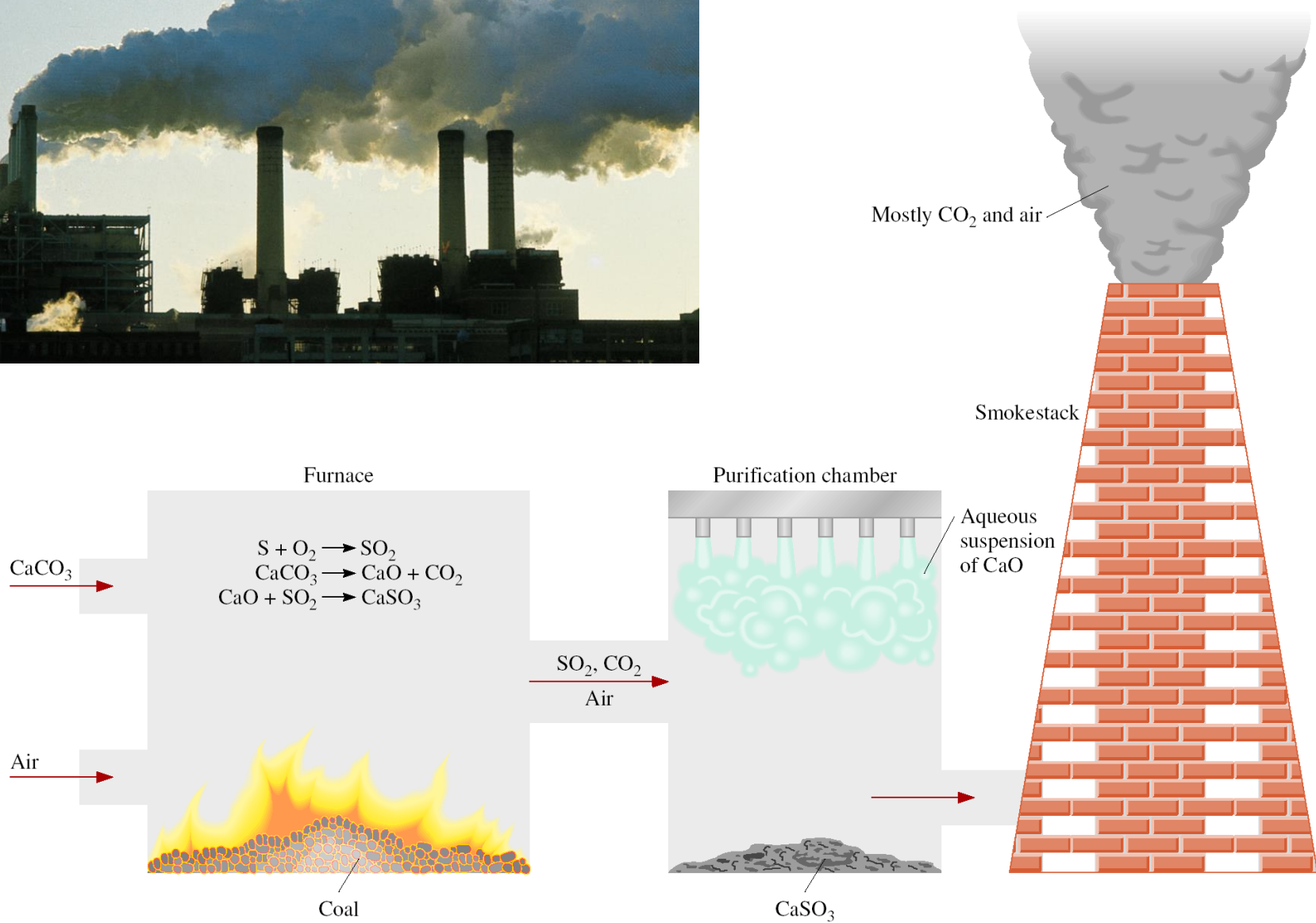


Acid Rain





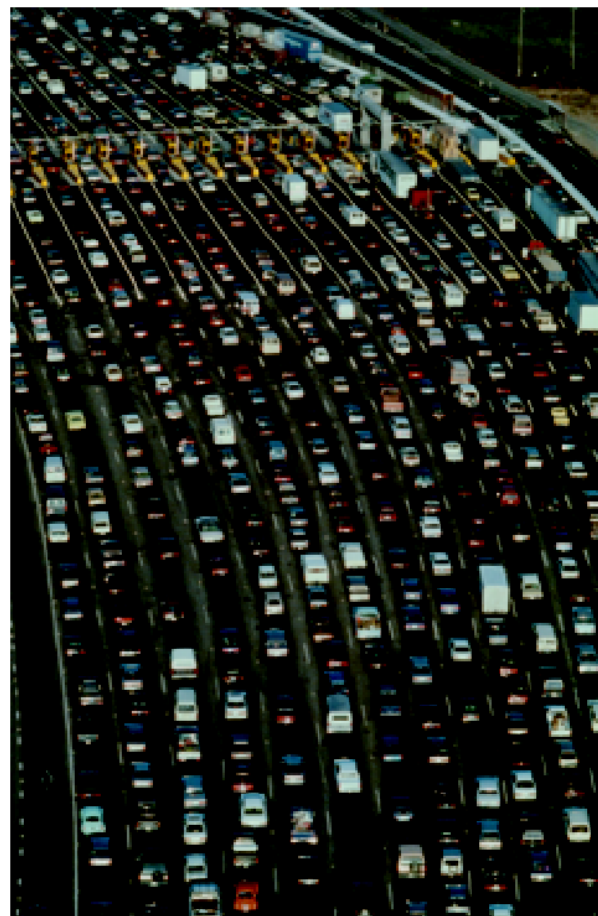
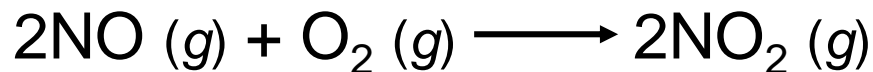
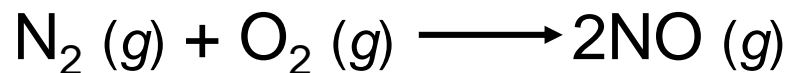
The Effect of Acid Rain on the Marble Statue of George Washington (New York, City). Photos Taken in 1944 and 1994



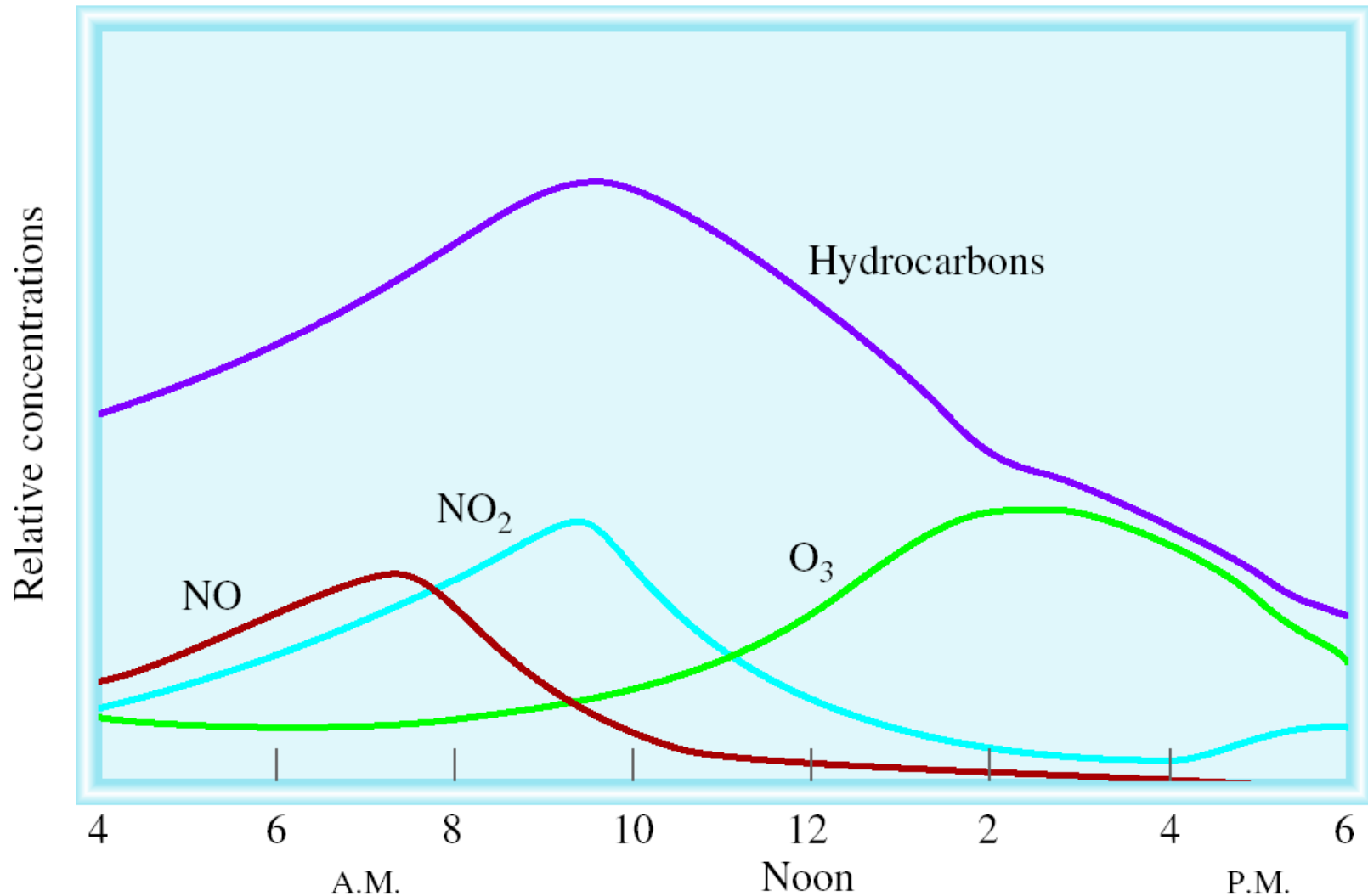
Photochemical smog is formed by the reactions of automobile exhaust in the presence of sunlight.

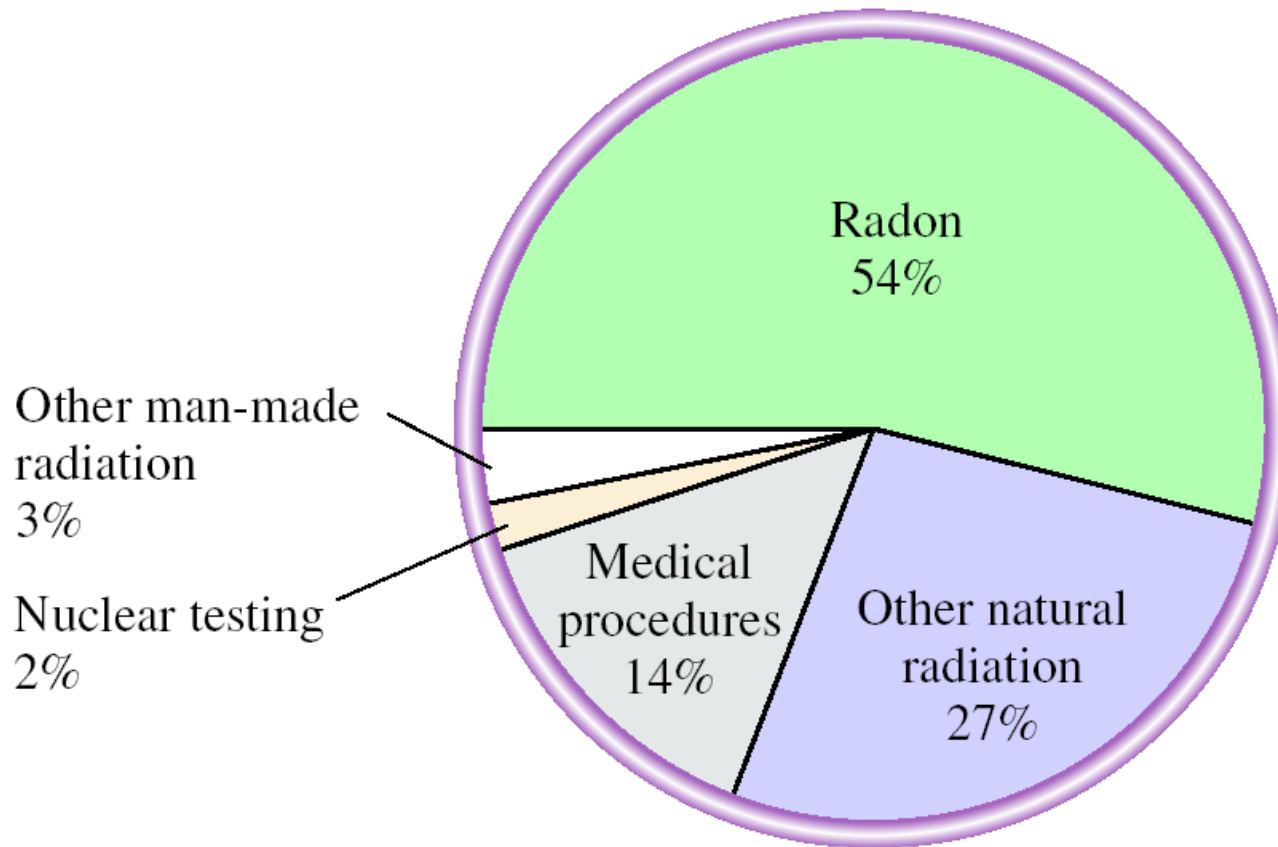
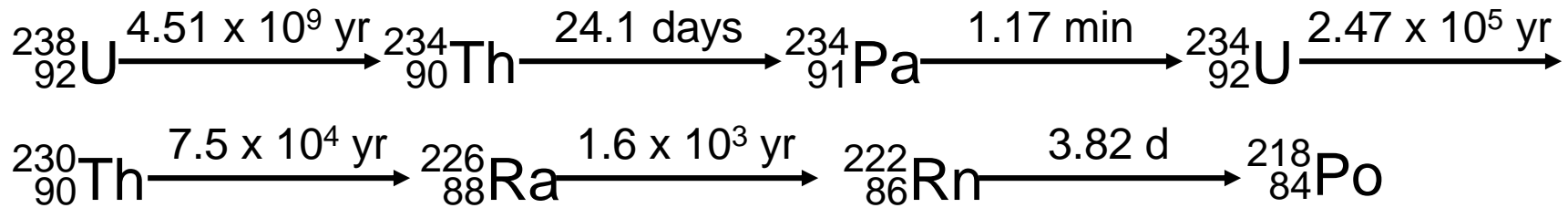
Primary pollutants: NO, CO and unburned hydrocarbons

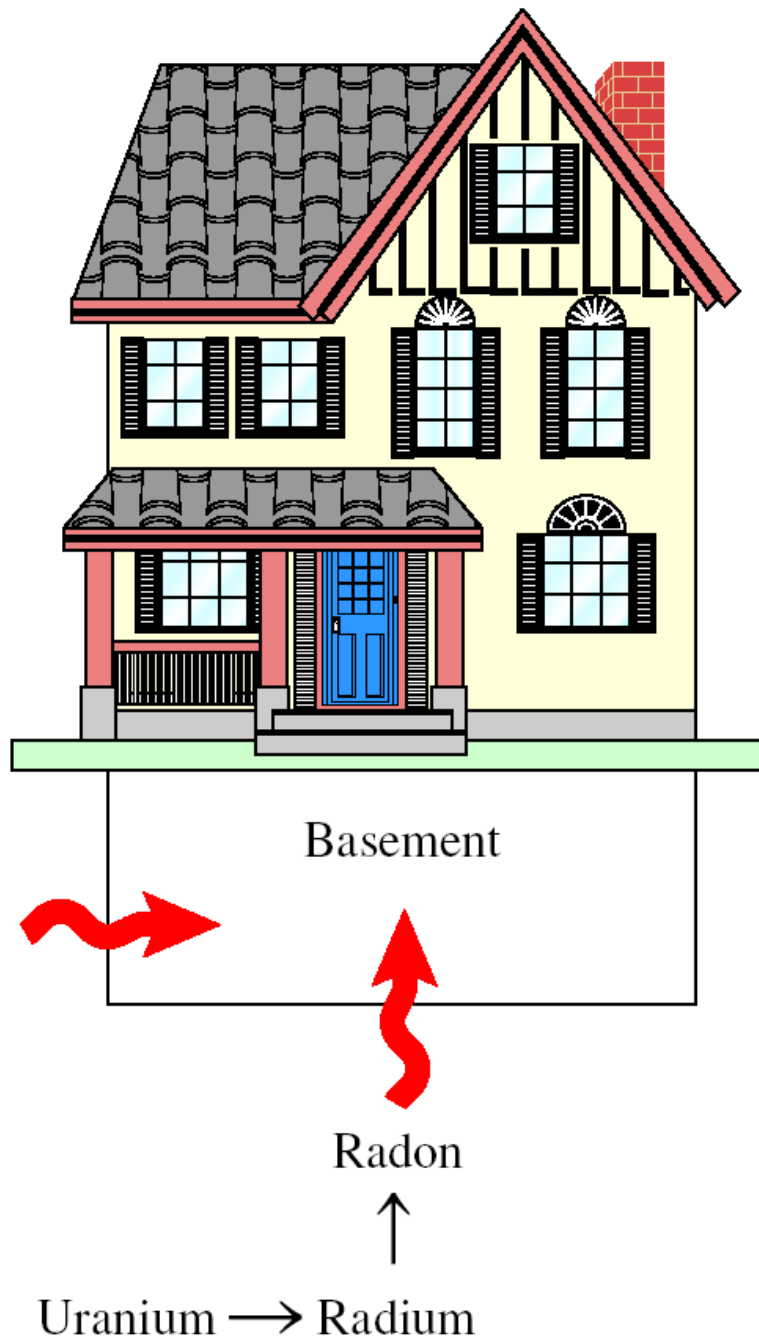
Secondary pollutants: NO₂ and O₃



Typical Variations with Time in Concentration of Air Pollutants on a Smoggy Day.







Home Radon Detectors