

deposited on the Earth's surface. Thus the oxidation reactions are vital to the cleansing of the air.

In this chapter, the chemistry of tropospheric air is examined. The detrimental effects on animals, plants, and materials of polluted air, including that which we encounter indoors, and methods by which air pollution can be combated, are described. Then the detailed reactions that occur in clean air and the processes encountered in the polluted air of modern cities are analyzed. Although the mechanisms of the reactions in polluted air appear complex, they follow the same set of principles described for clean air. It is only by understanding the science underlying such complicated environmental problems that we can hope to solve them.

Concentration Units for Atmospheric Pollutants

There is no consensus regarding the appropriate units by which to express concentrations of substances in air. In Chapter 2, ratios involving numbers of molecules—the “parts per” system—were emphasized as a measure. Other measures are often also encountered, and will be used in this chapter:

Molecules of a gas per cubic centimeter of air

Micrograms of a substance per cubic meter of air, $\mu\text{g}/\text{m}^3$

Moles of a gas per liter of air

Given the lack of a consensus on a single appropriate scale, it is important to be able to convert gas concentrations from one set of units to another. This form of manipulation is discussed in Box 3-1.

Urban Ozone: The Photochemical Smog Process

The Origin and Occurrence of Smog

Many urban areas in the world undergo episodes of air pollution during which relatively high levels of ground-level ozone, O_3 —an undesirable constituent of air if present in appreciable concentrations at low altitudes—are produced as a result of the light-induced reaction of pollutants. This phenomenon is called **photochemical smog**, and is sometimes characterized as “an ozone layer in the wrong place” to contrast it with the stratospheric ozone whose depletion was discussed in Chapter 2. The word “smog” itself is a combination of “smoke” and “fog.” The process of smog formation actually involves hundreds of different reactions, involving dozens of chemicals, occurring simultaneously; indeed, urban atmospheres have been referred to as “giant chemical reactors.” The most important reactions that occur in such air masses will be discussed in detail later in this chapter.