

FIGURE 7.2

Formation of the ozone shield. Before free oxygen existed in the atmosphere, the ultraviolet rays from the Sun were not barred from striking the surface of the Earth. About 2 billion years ago, enough free (uncombined) oxygen had accumulated to build an invisible layer of molecules of O_3 . This ozone shield absorbs most of the ultraviolet radiation from the Sun, protecting life on the Earth's surface from cell-damaging radiation.

the addition to the Earth's oxygen from this source is thought to have been minor compared to biological photosynthesis, it is still thought to have been significant.

Photosynthesis. Evidence suggests the ozone screen was primarily erected by the first plants, the blue-green algae, that also helped to transform the planet's atmosphere from a dense layer of carbon dioxide and other noxious gases into the oxygen-rich atmosphere of today. Photosynthesis is the process by which green plants utilize the Sun's energy to convert carbon dioxide (CO_2) and water (H_2O) into

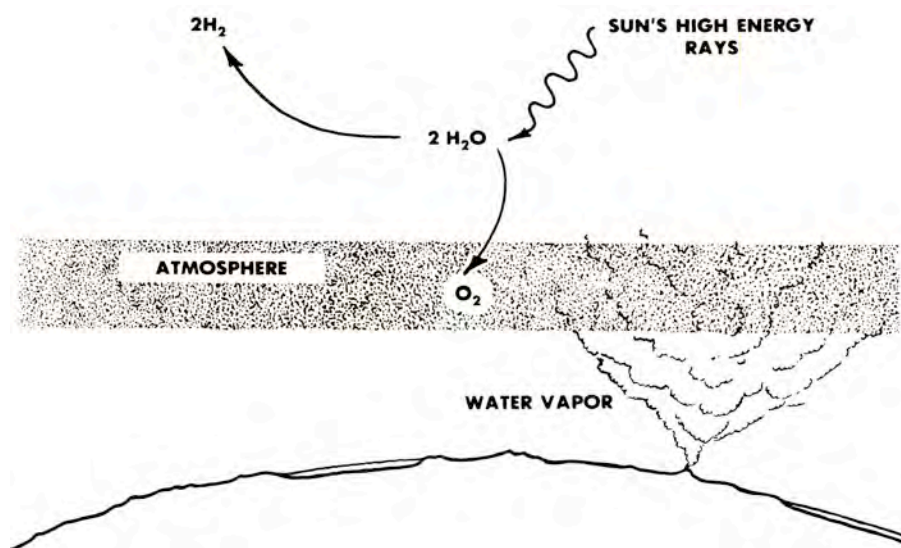


FIGURE 7.3

Atmospheric photolysis. Water vapor (H_2O) rising into the upper atmosphere is split by the Sun's ultraviolet (high energy) rays into its chemical elements of hydrogen and oxygen. The mass of the Earth is small enough to let the hydrogen escape to outer space. The Earth's mass is large enough so that oxygen is retained in the atmosphere through the force of gravitational attraction.