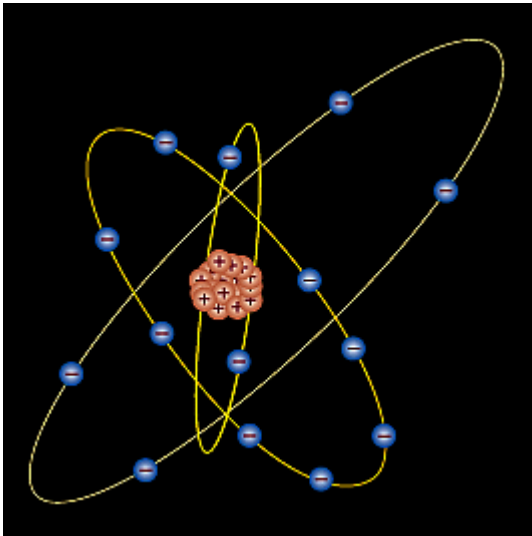


An Atomic Description of Silicon - The Silicon Molecule



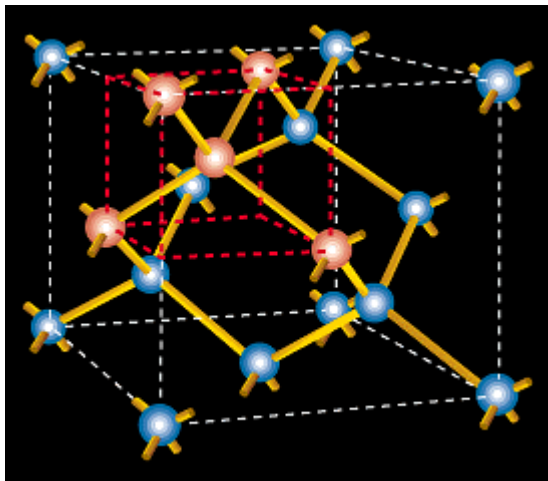
As depicted in this simplified diagram, silicon has 14 electrons. The four electrons that orbit the nucleus in the outermost, or "valence," energy level are given to, accepted from, or shared with other atoms.

An Atomic Description of Silicon. All matter is composed of atoms. Atoms, in turn, are composed of positively charged protons, negatively charged electrons, and neutral neutrons. The protons and neutrons, which are of approximately equal size, comprise the close-packed central "nucleus" of the atom, where almost all of the mass of the atom is located. The much lighter electrons orbit

the nucleus at very high velocities. Although the atom is built from oppositely charged particles, its overall charge is neutral because it contains an equal number of positive protons and negative electrons.

The electrons orbit the nucleus at different distances, depending on their energy level; an electron with less energy orbits close to the nucleus, whereas one of greater energy orbits farther away. The electrons farthest from the nucleus interact with those of neighboring atoms to determine the way solid structures are formed.

The silicon atom has 14 electrons, but their natural orbital arrangement allows only the outer four of these to be given to, accepted from, or shared with other atoms. These outer four electrons, called "valence" electrons, play an important role in the photovoltaic effect.



Large numbers of silicon atoms, through their valence electrons, can bond together to form a crystal. In a crystalline solid, each silicon atom normally shares one of its four valence electrons in a "covalent" bond with each of four neighboring silicon atoms. The solid, then, consists of basic units of five silicon atoms: the original atom plus the four other atoms with which it shares its valence electrons. In the basic unit of a crystalline silicon solid, a silicon atom shares each of its four valence electrons with each of four neighboring atoms.

The solid silicon crystal, then, is composed of a regular series of units of five silicon atoms. This regular, fixed arrangement of silicon atoms is known as the "crystal lattice."