Carbon atoms can bond to each other. If each bond to four others, they give the structure of diamond.

Carbon

Methane
Orbitals dictate a tetrahedral molecule.

Ammonia
Orbitals dictate a pyramidal molecule.

Nitrogen
N\textsubscript{2} (and its triple bond)

Silicon

Carbonate [CO\textsubscript{3}\textsuperscript{2-}]
A triangular structural group

Silicate [SiO\textsubscript{4}\textsuperscript{4-}]
The silica tetrahedron, as in SiO\textsubscript{2}

Silicon

Germanate [GeO\textsubscript{4}\textsuperscript{4-}]
The germanium analog of the silica tetrahedron

Germanium

In\textsubscript{2}Sn in SnO\textsubscript{2} and other compounds
Sn has the same electronegativity as Si and Ge, so Sn-O bonds should be as covalent as those in GeO\textsubscript{2} and SiO\textsubscript{2}. However, the larger size of the Sn\textsuperscript{4+} cation allows either four-fold or six-fold coordination, rather than strictly the four-fold coordination suggested by the four unpaired sp\textsuperscript{3} electrons.

Tin

This document is intended to address the shizophrenia in chemistry, or at least in the author's mind, about the relative importance of orbitals and covalent bonding on the one hand and ionic behavior on the other. As an example of that schizophrenia, consider an oxygen atom in a sulfate tetrahedron bonded to a calcium atom, as in anhydrite. The S-O bond is considered 80% covalent, and the Na-O bond is considered 80% ionic. How does an oxygen atom remain, to 80% of its mind, about the relative importance of orbitals and covalent bonding on the one hand and ionic bonding or structure, as suggested here by its ionic bond to Na\textsuperscript{+}.

Sulfur

Sulfate [SO\textsubscript{4}\textsuperscript{2-}]
a tetrahedral structural group

Sulfursenate [AsO\textsubscript{4}\textsuperscript{3-}]
(am a pyramidal structural group in sulfates)

Arsenic

Fluorine

Perchlorate [ClO\textsubscript{4}\textsuperscript{3-}]
No sharing of electrons

Chlorine

Legend:
(One atom’s) pair of electrons filling one orbital
One covalent bond (two atoms sharing two electrons, each from one atom)
Pathways that the reader is encouraged to follow (i.e., through elemental forms like N\textsubscript{2} and O\textsubscript{2}, through H-bearing forms like NH\textsubscript{3} and H\textsubscript{2}O, and in molecules, e.g., through nitrates formed by Group IV elements C, Si, Ge, Sn, etc.)