



Lewis Electron-Dot Structures

Both ionic and covalent bonds involve **valence electrons**, the electrons in the outermost energy level of an atom. **Lewis structures** uses dots to represent valence electrons.

valence electron an electron that is found in the outermost shell of an atom and that determines the atom's chemical properties.

Lewis structure a structural formula in which electrons are represented by dots (dot pairs or dashes between two atomic symbols represent pairs in covalent bonds).

When drawing hydrogen's Lewis structure, you represent the nucleus by the element's symbol, H. The lone valence electron is represented by a dot.



When two hydrogen atoms form a nonpolar covalent bond, they share two electrons. These two electrons are represented by a pair of dots between the symbols.



This Lewis structure represents a stable hydrogen molecule in which both atoms share the same pair of electrons.

Lewis Structures of the Second-Period Elements

Element	Electron configuration	Number of valence electrons	Lewis structure (for bonding)
Li	$1s^2 2s^1$	1	Li·
Be	$1s^2 2s^2$	2	·Be·
B	$1s^2 2s^2 2p^1$	3	·B·
C	$1s^2 2s^2 2p^2$	4	·C·
N	$1s^2 2s^2 2p^3$	5	·N·
O	$1s^2 2s^2 2p^4$	6	·O·
F	$1s^2 2s^2 2p^5$	7	·F·
Ne	$1s^2 2s^2 2p^6$	8	·Ne·

Lewis Structures Show Valence Electrons

The Lewis structure of a chlorine atom shows only the atom's seven valence electrons. Its Lewis structure is written with three pairs of electrons and one unpaired electron around the element's symbol, as shown below.



An element with an octet of valence electrons, such as that found in the noble gas Ne, has a stable configuration. When two chlorine atoms form a covalent bond, each atom contributes one electron to a shared pair. With this shared pair, both atoms can have a stable octet. This tendency of bonded atoms to have octets of valence electrons is called the *octet rule*.

