

## Covalent Bonding

### The Octet Rule and Covalent Compounds:

- Covalent compounds tend to form so that each atom, by sharing electrons, has an octet of electrons in its highest occupied energy level.
- Covalent compounds involve atoms of nonmetals only.
- The term molecule is used exclusively for covalent bonding.

### Lewis Structures:

- Lewis structures show how valence electrons are arranged among atoms in a molecule.
- Lewis structures reflect the central idea that stability of a compound relates to noble gas electron configuration.
- Shared electrons pairs are covalent bonds and can be represented by two dots (:) or by a single line (-)

### The HONC Rule:

- Hydrogen (and Halogens) form one covalent bond.
- Oxygen (and Sulfur) form two covalent bonds.
  - o One double bond or two covalent bonds
- Nitrogen (and Phosphorus) form three covalent bonds.
  - o One triple bond, or three single bonds, or one double bond and a single bond.
- Carbon (and Silicon) form four covalent bonds.
  - o Two double bonds, or four single bonds, or a triple and a single bond, or a double and two single bonds.

### Competing a Lewis Structure –CH<sub>3</sub>Cl:

- Make carbon the central atom (it wants the most bonds, 4)
- Add up available valence electrons:
  - o C=4 H=(3)(1) Cl=7 total =14
- Join peripheral atoms to the central atom with electron pairs.
- Complete octets on atoms other than hydrogen with remaining electrons.

### Bond Length and Bond Energy:

Bond	Length (pm)	Energy (kJ/mol)
C-C	154	346
C--C	134	612
C---C	120	835
C-N	147	305
C--N	132	615
C---N	116	887
C-O	143	358
C--O	120	779
C---O	113	1072
N-N	145	180
N--N	125	418

N---N	110	942
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**Resonance:**

- Occurs when or then one valid Lewis structure can be written for a particular molecule.