

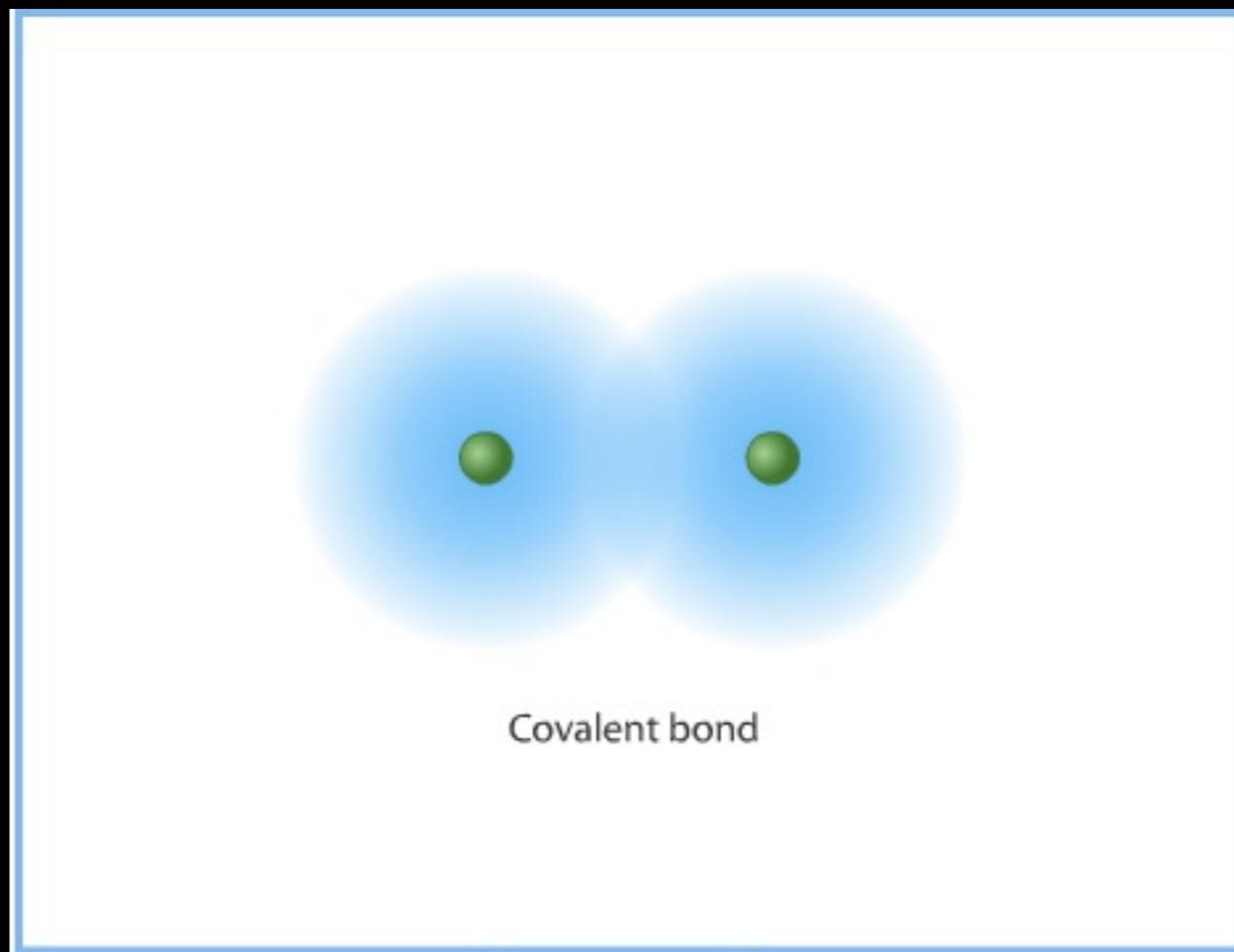
# 4.2 Covalent bonding

## Interatomic Interactions



# Covalent bond:

- the electrostatic attraction between a pair of electrons and positively charged nuclei.
- the sharing of electrons between atoms.



# General Rule:

Covalent if a nonmetal + nonmetal

To determine covalent bond type,  
use electronegativity values:

<b>Electronegativity Difference</b>	<b>Bond type</b>
<b><math>&lt; 0.3</math></b>	<b>nonpolar covalent</b>
<b><math>0.3 - 1.7</math></b>	<b>polar covalent</b>
<b><math>&gt; 1.7</math></b>	<b>ionic</b>

# Online Tutorial

A periodic table of elements with group and period labels. The groups are labeled 1 through 18, and the periods are labeled 1 through 7. The elements are arranged in a grid, with the f-block (lanthanides and actinides) shown below the main body of the table. The elements are color-coded: Group 1 (light blue), Group 2 (red), Groups 13-17 (green), and Group 18 (light green). The f-block elements are in red boxes.

Period	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8	Group 9	Group 10	Group 11	Group 12	Group 13	Group 14	Group 15	Group 16	Group 17	Group 18
1	1 H																	2 He
2	3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
3	11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
4	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
5	37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
6	55 Cs	56 Ba	57 La	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
7	87 Fr	88 Ra	89 Ac	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Dg	111 Rg	112 Cn						
				58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu	
				90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr	



# Naming

Use prefixes to name binary molecular compounds:

1	mono		6	hexa
2	di		7	hepta
3	tri		8	octa
4	tetra		9	nona
5	penta		10	deca

# Lewis structures:

The use of dots and dashes to represent the valence electrons of an atom, ion, or molecule.

## Steps for drawing Lewis structures for molecules or polyatomic ions:

1. Total all valence electrons (and charges).
2. Connect all atoms to a central atom.
3. Add dots to complete an octet around every atom connected to a central atom (except hydrogen).
4. Add dots to complete the central atom's octet.
5. If too few electrons are available, use multiple bonds.

# The HONC Rule

Exceptions to the octet rule:

1. Hydrogen will have only 1 pair of electrons surrounding it.
2. Boron will only have 3 pairs of electrons surrounding it.
3. Beryllium (a metal) can form covalent bonds with only have 2 pairs of electrons surrounding it.

4. Sulfur and Phosphorus will occasionally have more than 4 pairs of electrons by using their empty d-orbitals.

This is called an “expanded octet.”

Special note regarding oxyacids:

(H bonded to an oxyanion)

Hydrogen will ALWAYS be bonded to the oxygen atom(s).

Special note regarding carbon:

Carbon rarely has an unshared pair of electrons.

Two exceptions:

CO

carbon monoxide

CN<sup>-</sup>

cyanide

Is your Lewis structure correct?

Two simple questions to ask:

1.) Did you use the exact number of valence electrons available?

2.) Are all atoms (except hydrogen) surrounded by 8 electrons?