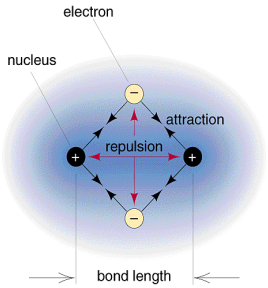
Hey, Baby. You and I Have a Bond…Covalent Bonding…Ch. 9

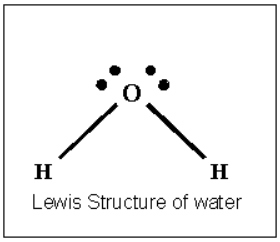


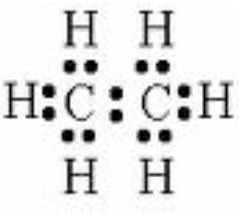
I. Covalent Bond Background

A. What happens when two elements want electrons?

1. They
2. Covalent bond:
3. If the

a bond is formed.

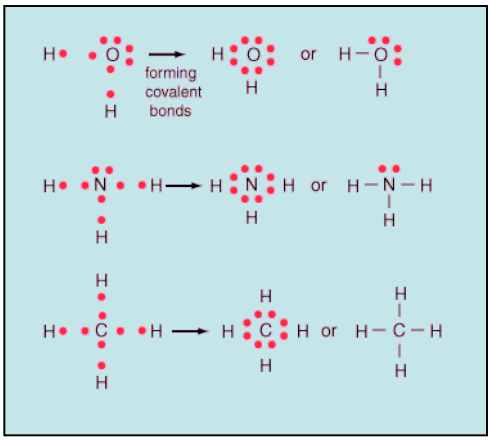




II.Drawing Molecules

A. Lewis Dot

1.
2. These are used to model covalently bonded molecules.
   a.
   b.



B. Drawing Lewis Structures for Molecules

1. Count the number of valence electrons you have.
2. Arrange the atoms. The single atom is usually in the center (usu. carbon)

3. Draw single bonds (one line) between all atoms and subtract the number of electrons you used.

4. Fill in the remaining electrons around outer atoms until you run out.

   a. Extra electrons? Place them on the central atom.

   b. Need electrons? Move outer electrons into a double or triple bond.

5. NOTE: CHECK YOUR WORK!!!
   a. Structures MUST only have the amount of valence electrons that you started with.
   b. Make sure that ALL the atoms are eight!
6. Examples:

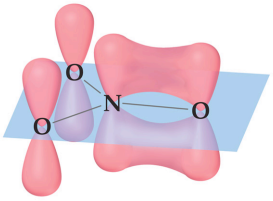
HCl CH_4 OF_2 N_2 SO_3

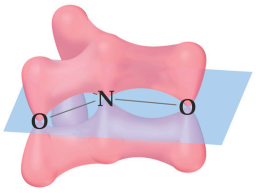
C. Structures for polyatomic ions:

1. When drawing a Lewis structure of an ion, follow all the steps above and then:
   a. Place
   b. Place the
2. Ex: NH_4^+ CO_3^{2-} NO_3^-

D. Structures:

1. For some molecules,
2. These molecules show
3. The of all the resonance structures.
4. Draw a
5. Example: NO_3^-





E. Octet Exceptions:

1.
2.
3.

III. Molecular Shapes (see handout)

A. Lewis structures can be used to predict shapes.

B. The shape of molecules is described using models

C.

1.

D. We Will Study Five Shapes

1.
   a. Bond angle =
   b. Examples: O_2, HCl, CO_2
2.
   a. Bond angle =
   b. Example: BCl_3, CO_3^{2-}
3.
   a. Bond angle =
   b. Examples: CH_4, CF_4
4.
   a. Bond angle =
   b. Examples: NH_3, PCl_3
5.
   a. Bond angle =
   b. Example: H_2O.

E. Examples:

What is the shape of PI_3?

What is the shape of HCN?

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IV. Polarity

A. A molecule is

B. Determining Polarity:

1. The determine whether the molecule is

2.

3.

4.

C. Examples:

Water

Formaldehyde (H_2CO)

CH_4

CH_3Cl

SO_3

V. Naming Covalent Compounds

A. Name the elements in the order they appear.

B. Replace the last syllable in the name of the final element with "–ide."

C. Add prefixes to the name of each element to indicate the number of atoms of that element in the molecule.

1. Mono-, di-, tri-, tetra-, penta-, hexa-, hepta-, octa-, nona-, deca-
2. The prefix mono- is omitted for the first element.

D. Examples

1. CO_2
2. SCl_6
3. N_2O_5

E. Acid Names and Formulas

1. Acids are combinations of the
   a. Examples:
2. Naming of acids are based on the
   a. Anions with ending are named
      Examples: hydrochloric acid

      HBr

   b. Anions with ending are named
      Examples: HNO_3

      acetic acid

      H_2CO_3

   c. Anions with ending are named

      Examples: chlorous acid

      H_3PO_3

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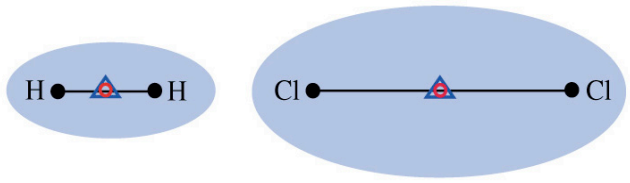
VI. Types of Covalent Bonds

A. Electronegativity (EN) and Covalent Bonding

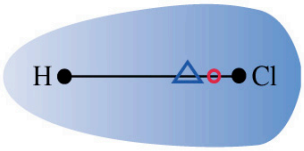
1. Elements have different EN's.
2. Ex: Cl_2, O_2.
3.
   a. Dipoles are bonds with Designated with "δ".
   b. The ( ).

B. Predicting Bond Types – (p. 263)

1.
2.
3.



(a) Nonpolar covalent bonds



(b) Polar covalent bond

● = Atomic nucleus
△ = Center of positive charge
o = Center of negative charge

VII. Properties of Covalent Compounds

A. Between molecules, the forces are

1. Because of this, they are
2. They also have

B. Electrons are

1. Thus, they

VIII. Bond Energetics

A. Energy changes in bonds

1. When a bond is , energy is
2. When a bond is , energy is

IX. Metallic Bonding

I. Metals have

II. When metals are bonded, they don't want their electrons.

III. Their electrons thus flow like a

IV. This gives rise to the fact that metals are