Unit 4: Covalent Bonding

Molecule: Two or more atoms that are covalently bonded.

Covalent (or Molecular) Compound: A pure substance composed of identical molecules

How can we determine whether a bond is ionic or covalent?

As a general rule:

<u>Covalent bonds</u> form between *nonmetals* (sharing of electrons).

Ex. CO
C = nonmetal
O = nonmetal

<u>Ionic bonds</u> form between a *metal* and a *nonmetal* (attraction between cation and anion).

Ex. NaCl
Na = metal
Cl = nonmetal

To determine the *exact* bond type, use the difference in electronegativity between the bonding atoms…

Determining Bond Type

Electronegativity Difference (ΔEN)

0.0 — **0.3** — **1.7**

Nonpolar Covalent	Polar Covalent	Ionic
(≤ 0.3)	(between 0.3 - 1.7)	(≥ 1.7)
Equal sharing of e^-	Unequal sharing of e^-	Loss or gain of e^-
No charges	Partial charges	Full ionic charges
Ex. H—H	Ex. $\overset{\delta+}{H}$—$\overset{\delta-}{Cl}$	Ex. Na^+ Cl^-

2 Types of covalent bonds

Delta (δ) represents polarity (partial charge)

Practice

Classify each bond as nonpolar covalent, polar covalent*, or ionic.

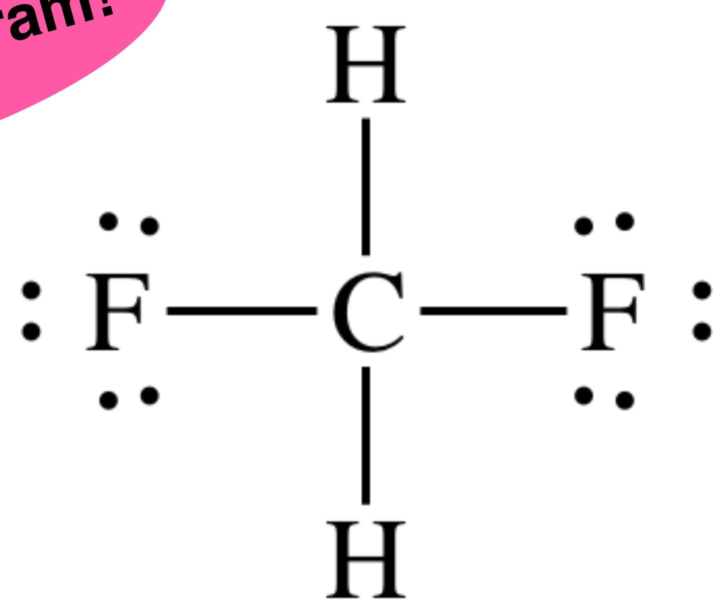
*If polar covalent, add **δ**+ or **δ**- to show polarity.

Cl—C	Cl—K	Cl—Cl
(3.2) (2.5)	(3.2) (0.8)	(3.2) (3.2)

To be completed in class!
(leave 2 lines below)

Lewis structures: The use of dots and dashes to represent bonding and nonbonding pairs of electrons in a molecule.

Draw this diagram!



**Each line represents a *shared pair* of e^-.

Steps for drawing Lewis structures

1. Total the valence electrons from all atoms in the molecule (if an ion, add or subtract its charge).
2. Use dashes to connect all atoms to a “central” atom.
3. Add dots to the outer atoms to complete their octet (except H).

For steps, leave space on the right-hand side of your notes for examples

4. Add remaining electrons to complete the central atom's octet…
5. If there aren't enough electrons, use lone pairs on the outer atoms to form double (=) or triple (≡) bonds.

   **Only C, N, and O can form triple bonds.

6. If an ion, put the structure in brackets and write the charge on the top right, outside the brackets.

For steps, leave space on the right-hand side of your notes for examples

Is your Lewis structure correct?

- ☑ Used the exact number of valence e^- available

- ☑ All atoms (except H) surrounded by 8 e^-