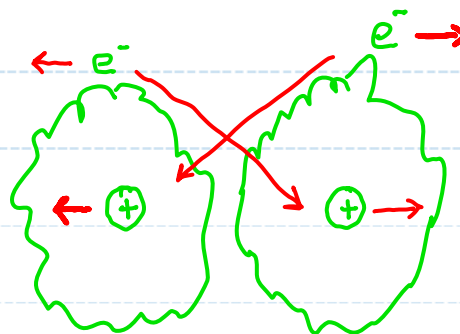
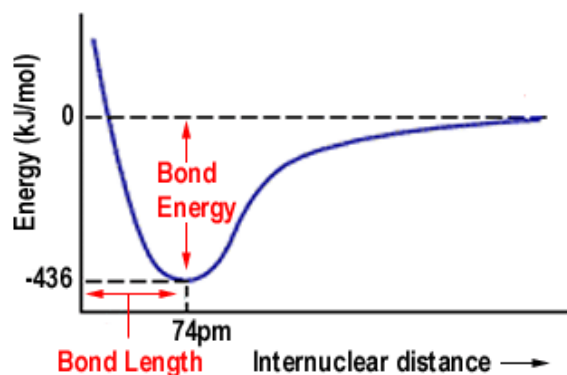


Class Announcements



3.7 A

What Is a Covalent Bond and How Does One Form? The Pro's and Cons of Orbital Overlap



Con:

- a) electron/electron repulsion
- b) proton/proton repulsion

Pro:

- a) electron/proton attraction

? Is this really the story ??

3.7

What Is a Covalent Bond and How Does One Form?

C

Drawing Lewis Structures of Covalent Compounds

Group I:

Bond Pair and Lone Pair Electrons

CH₄

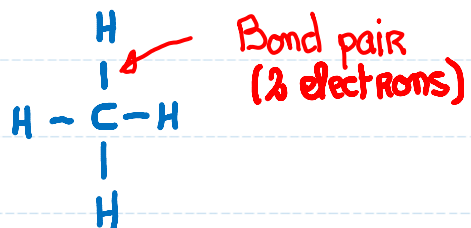
C: 4

H: 4(1)

8

4x BP -8

0



BP = Bond pair

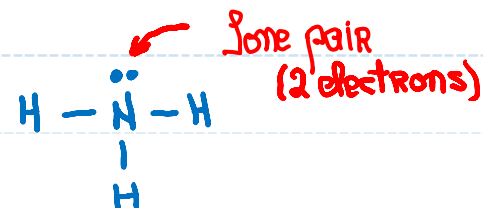
NH₃

N: 5

H: 3(1)

8

3x BP -6

LP -2
0H₂O

O: 6

H: 2(1)

8

2x BP -4

4

2x LP -4

0

SiF₄

Si: 4

F: 4(7)

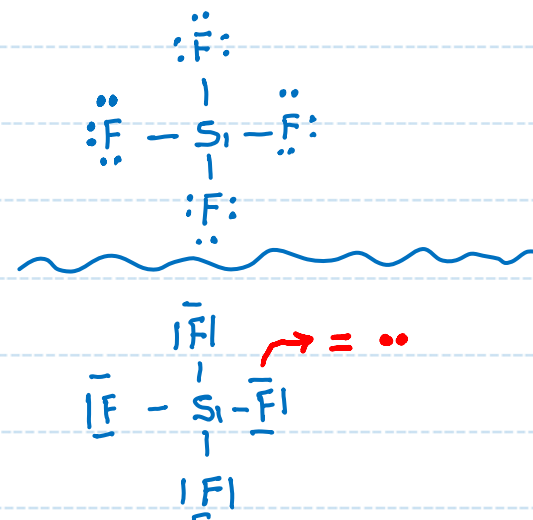
32

4x BP -8

24

12x LP -24

0



3.7

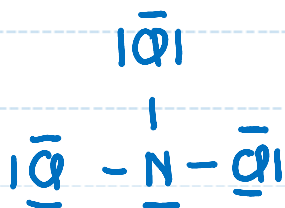
C

Group I:

What Is a Covalent Bond and How Does One Form?

Drawing Lewis Structures of Covalent Compounds

Bond Pair and Lone Pair Electrons



Lone pairs on Cl?

a) 1

b) 9

c) 3



Notes

- 1) The least electronegative atom in the center ... *Why? ... unless* otherwise indicated.
- 2) Hydrogen ... 2 (He) ... all other atoms ... 8 (Ne → Rn)
- 3) Allocate electrons to the outer atoms first *then attend to the* central atom.
- 4) Be able to distinguish between Bond Pair (BP) and Lone Pair (LP) electrons
- 5) Acceptable shorthand ... $- = \cdot\cdot$

3.7

C

Group II:

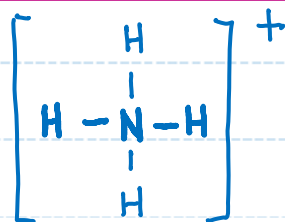
What Is a Covalent Bond and How Does One Form?

Drawing Lewis Structures of Covalent Compounds

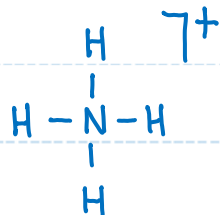
Dealing With Charges



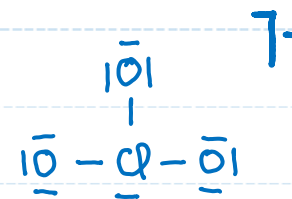
$$\begin{array}{r} \text{N: } 5 \\ \text{H: } 4(1) \\ + : \quad -1 \\ \hline 8 \\ 4 \times \text{BP} \quad -8 \\ \hline 0 \end{array}$$



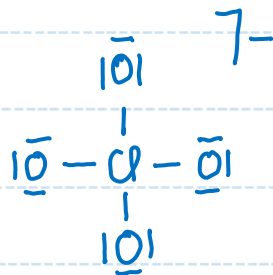
OR



$$\begin{array}{r} \text{Cl: } 7 \\ \text{O: } 3(6) \\ - : \quad 1 \\ \hline 26 \\ 3 \times \text{BP} \quad -6 \\ \hline 20 \\ 9 \times \text{LP} \quad -18 \\ \hline 2 \\ 1 \times \text{LP} \quad -2 \\ \hline 0 \end{array}$$



$$\begin{array}{r} \text{Cl: } 7 \\ \text{O: } 4(6) \\ - : \quad 1 \\ \hline 32 \\ 4 \times \text{BP} \quad -8 \\ \hline 24 \\ 12 \times \text{LP} \quad -24 \\ \hline 0 \end{array}$$



Notes

- Anions increase the valence electron total.
- Cations decrease the valence electron total.
- Use parenthesis ... [] or $^+$

3.7

C

Group III:

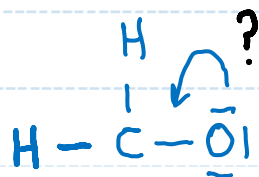
What Is a Covalent Bond and How Does One Form?

Drawing Lewis Structures of Covalent Compounds

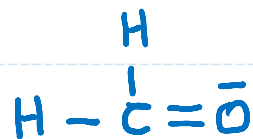
Shortage of Electrons ... Multiple Bonds



$$\begin{array}{r}
 \text{H:} \quad 2(1) \\
 \text{C:} \quad 4 \\
 \text{O:} \quad 6 \\
 \hline
 12 \\
 3 \times \text{BP} \quad -6 \\
 \hline
 6 \\
 3 \times \text{LP} \quad -6 \\
 \hline
 0
 \end{array}$$



? Do I have a terminal atom with at least one lone pair on it. ✓



? Are both atoms that are about to form a multiple bond members of

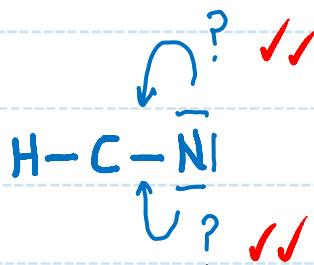
CNOPS. ✓

↑ Double bond

↓ Make a multiple bond



$$\begin{array}{r}
 \text{H:} \quad 1 \\
 \text{C:} \quad 4 \\
 \text{N:} \quad 5 \\
 \hline
 10 \\
 2 \times \text{BP} \quad -4 \\
 \hline
 6 \\
 3 \times \text{LP} \quad -6 \\
 \hline
 0
 \end{array}$$



↑ Triple bond



3.7

C

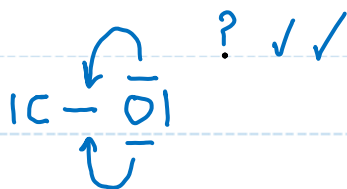
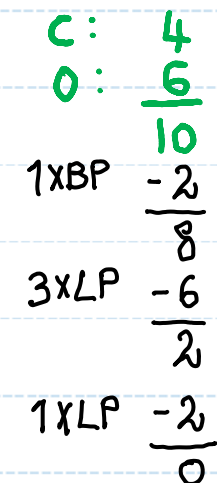
Group III:

What Is a Covalent Bond and How Does One Form?

Drawing Lewis Structures of Covalent Compounds

Shortage of Electrons ... Multiple Bonds

CO



Notes

Multiple bonds a possibility when the central atom does not have an octet when all the valence electrons have been distributed if _

- There is a terminal atom with at least one lone pair of electrons and...
- Both atoms forming the multiple bond are members of [NOPS].

3.7

What Is a Covalent Bond and How Does One Form?

C

Drawing Lewis Structures of Covalent Compounds

Group III:

Shortage of Electrons ... Multiple Bonds

 F_2CO (Not on Worksheet)

$$F: \quad 2(7)$$

$$C: \quad 4$$

$$O: \quad 6$$

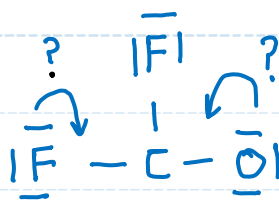
$$\hline 24$$

$$3 \times BP \quad -6$$

$$\hline 18$$

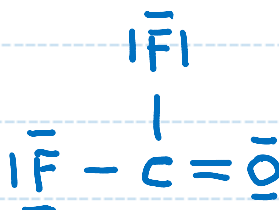
$$9 \times BP \quad -18$$

$$\hline 0$$



O: ✓ ✓

F: ✓ X



F not a member of CNOPS