Announcements – Lecture IX – Thursday, Oct 3rd
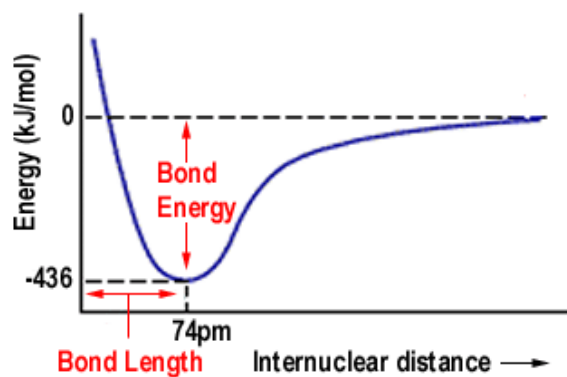
1.   Lab 2 – Saturday, October 5th, 1:00-4:00 pm – ISB 155/160 A-E
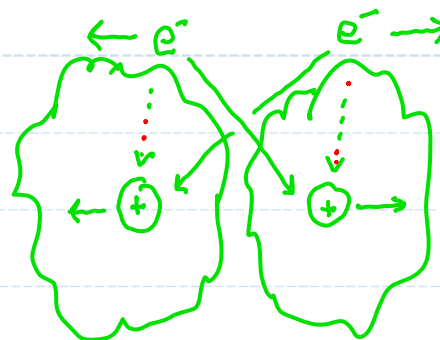
Energy (kJ/mol)

0

Bond Energy

-436

74pm

Bond Length   Internuclear distance →

See animation on class Net site

e⁻   e⁻

+   +

Con :

a) electron / electron Repulsion

b) proton / proton Repulsion

Pro :

a) electron / proton attraction

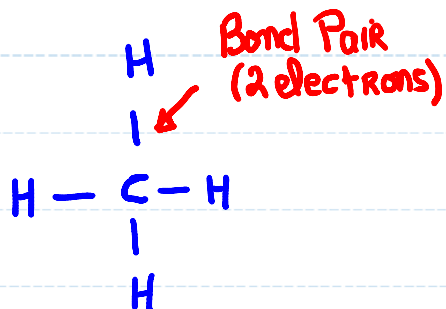**3.7**   **What Is a Covalent Bond and How Does One Form?**
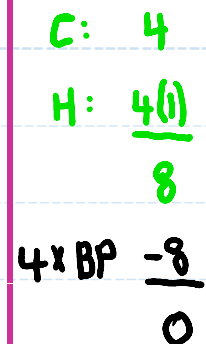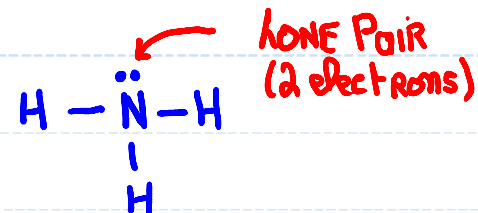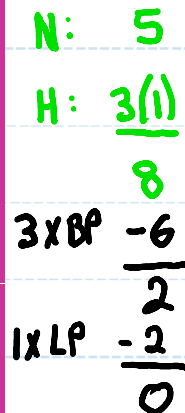**C**   **Drawing Lewis Structures of Covalent Compounds**
Group I: **Bond Pair and Lone Pair Electrons**

CH_4

C: 4

H: $\underline{4(1)}$

8

4 × BP $\dfrac{-8}{0}$

Bond Pair
(2 electrons)

H
|
H — C — H
|
H

BP = Bond Pair

NH_3

N: 5

H: $\underline{3(1)}$

8

3 × BP $\dfrac{-6}{2}$

1 × LP $\dfrac{-2}{0}$

Lone Pair
(2 electrons)

H — N̈ — H
|
H

LP: Lone Pair

H_2O

O: 6

H: $\underline{2(1)}$

8

2 × BP $\dfrac{-4}{4}$

2 × LP $\dfrac{-4}{0}$

H — Ö — H

SiF_4

Si: 4

F: $\underline{4(7)}$

32

4 × BP $\dfrac{-8}{24}$

12 × LP $\dfrac{-24}{0}$

:F̈:
|
:F̈ — S̈i — F̈:
|
:F̈:

|F̈|
|
|F̈ — Si — F̈|
|
|F̈|

NCl$_3$

N: 5
Cl: 3(7)
———
26

3×BP −6
———
20

9×LP −18
———
2

1×LP −2
———
0

$|\overline{\underline{Cl}}|$

$|\overline{\underline{Cl}} - \underline{N} - \overline{\underline{Cl}}|$
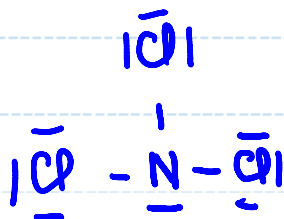
Lone pairs on Cl?
a) 1
b) 9
c) 3   ← (circled)

iclicker
B
READY

Notes

i) The least electronegative atom in the center ... Why? ... unless otherwise indicated.

ii) Hydrogen ... 2 ... [He] ... all other atoms .. 8 ([Ne] → [Rn])

iii) Allocate electrons to the outer atoms first the attend to the central atom.

iv) Be able to distinguish between Bond Pair (BP) and Lone Pair (LP) electrons.

v) Acceptable shorthand ..   − = ..

3.7   **What Is a Covalent Bond and How Does One Form?**
C   **Drawing Lewis Structures of Covalent Compounds**
Group II: **Dealing With Charges**

NH_4^+

N : 5
H : 4(1)
+ : -1
―――――
8
4 × BP -8
―――――
0

$$\left[\begin{array}{c} H \\ | \\ H - N - H \\ | \\ H \end{array} \right]^+$$

OR

$$\left. \begin{array}{c} H \\ | \\ H - N - H \\ | \\ H \end{array} \right]^+$$

ClO_3^-

Cl : 7
O : 3(6)
- : 1
―――――
26
3×BP -6
―――――
20
9×LP -18
―――――
2
1×LP -2
―――――
0

$$\left. \begin{array}{c} |\overline{O}| \\ | \\ |\overline{O} - Cl - \overline{O}| \end{array} \right]^-$$
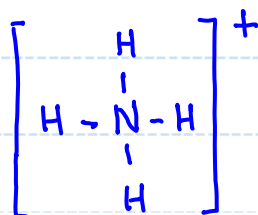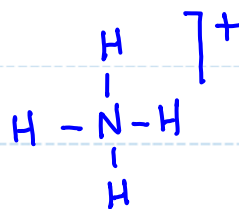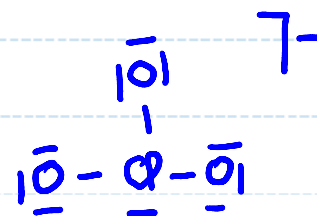
ClO_4^-   *Class Homework Exercise*

Cl : 7
O : 4(6)
- : 1
―――――
32
4×BP -8
―――――
24
12×LP -24
―――――
0

$$\begin{array}{c} |\overline{O}| \\ | \\ |\overline{O} - Cl - \overline{O}| \\ | \\ |\overline{O}| \end{array}$$
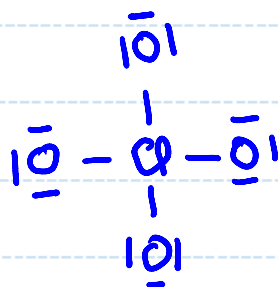
Notes

a) Negative charges increase the valence electron total.

b) Positive charges decrease the valence electron total.

c) Use parenthesis ... [ ] or ⌐ .

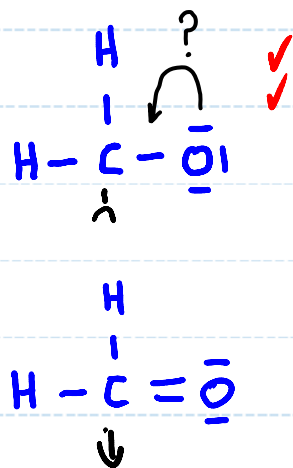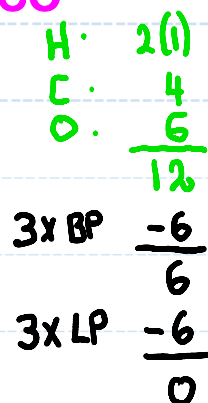**3.7**   **What Is a Covalent Bond and How Does One Form?**
C   **Drawing Lewis Structures of Covalent Compounds**
Group III: **Shortage of Electrons ... Multiple Bonds**

H$_2$CO

H·   2(1)
C·   4
O·   6
——————
      12

3x BP   −6
——————
       6

3x LP   −6
——————
       0

```
    H       ?        ✓
    |    ⌢    ✓
H — C — Ō|
    ˄


    H
    |
H — C = Ō
    ↓
```

? 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 **[NOPS** ?

Yes to both questions ... make a multiple bond

HCN