

## Announcements – Lecture XI – Thursday, June 5th

1. **Fourth Lab:** **Tuesday, June 10<sup>th</sup>, ISB 155 (A-C)**



# Quiz 8

Class #: \_\_\_\_\_

Last Name: \_\_\_\_\_

1. Rank the following (from 1-4) in order of increasing size with **1** being the **smallest** and **4** being the **largest**.

2 S      4 Ca      1 F      3 Mg

**The Periodic Table**

IA H 1 1.01											VIII A He 2 4.00						
II A Li 3 6.94	Be 4 9.01											III A B 5 10.81	IV A C 6 12.01	V A N 7 14.01	VI A O 8 16.00	VII A F 9 19.00	VIII A Ne 10 20.18
Na 11 22.99	Mg 12 24.31	III B	IV B	V B	VI B	VII B	VIII B	VIII B	VIII B	IB	IIB	Al 13 26.98	Si 14 28.09	P 15 30.97	S 16 32.07	Cl 17 35.45	Ar 18 39.95
K 19 39.10	Ca 20 40.08	Sc 21 44.96	Ti 22 47.88	V 23 50.94	Cr 24 52.00	Mn 25 54.94	Fe 26 55.85	Co 27 58.93	Ni 28 58.69	Cu 29 63.55	Zn 30 65.39	Ga 31 69.72	Ge 32 72.61	As 33 74.92	Se 34 78.96	Br 35 79.90	Kr 36 83.80

2. Which one has the greatest Electron Affinity?

F

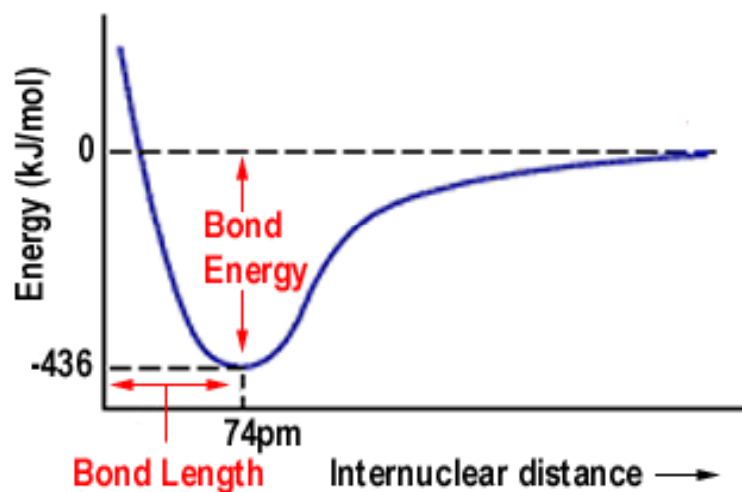
3. Which one has the smallest first ionization energy?

Ca



## 8.1 An Introduction to Covalent Bonding

### B: Fundamentals to Covalent Bonding



Pro:

i) Electron/Proton attraction

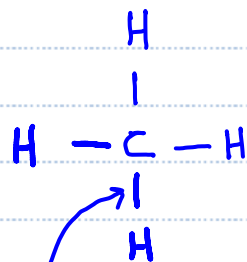
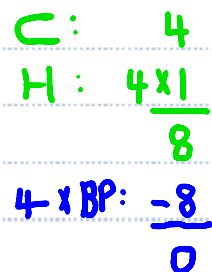
Con:

i) Electron/Electron repulsion

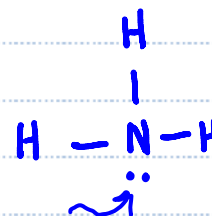
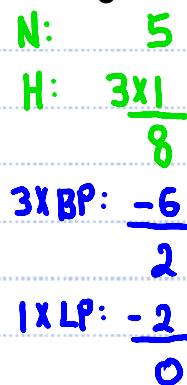
ii) Proton/Proton repulsion

## 8.2 Lewis Structures

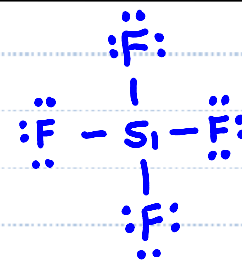
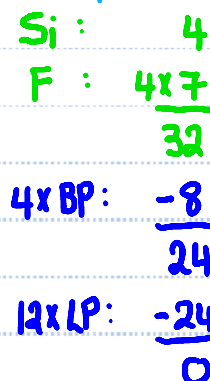
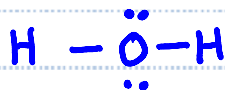
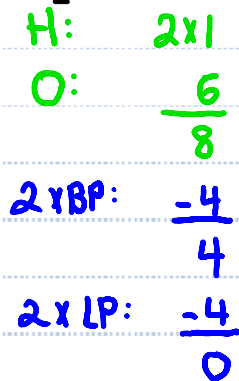
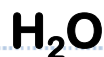
### B: Drawing Lewis Structures – Bond Pairs and Lone Pairs



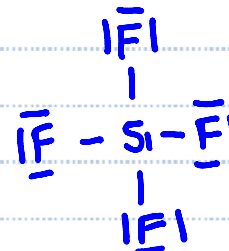
Bond pair of electrons (BP)



lone pair of electrons (LP)



OR



— = ..

## 8.2 Lewis Structures

### B: Drawing Lewis Structures – Bond Pairs and Lone Pairs

#### $\text{NCl}_3$ -- Homework

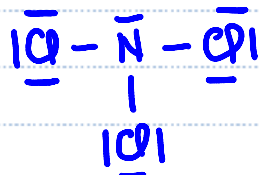
$$\text{N} : 5$$

$$\text{Cl} : \frac{3 \times 7}{26}$$

$$3 \times \text{BP} : \frac{-6}{20}$$

$$9 \times \text{LP} : \frac{-18}{2}$$

$$1 \times \text{LP} : \frac{-2}{0}$$



#### Notes

a) The least electronegative atom in the center unless otherwise indicated.

b) All outer atoms get an octet ... except hydrogen which only requires 2.

c) Central atom allocated electrons last.

d) Distinguish between BP and LP electrons.



## 8.2 Lewis Structures

### B: Drawing Lewis Structures – Dealing with Charges

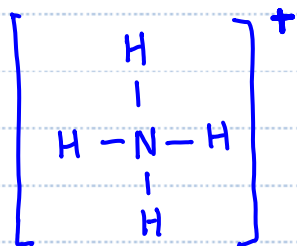


$$\text{N: } 5$$

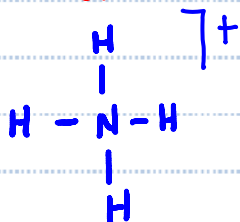
$$\text{H: } 4 \times 1$$

$$+ : \frac{-1}{8}$$

$$4 \times \text{BP: } \frac{-8}{0}$$



OR



$$\text{Cl: } 7$$

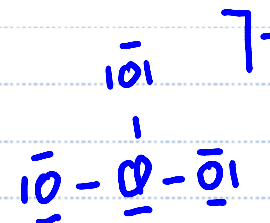
$$\text{O: } 3 \times 6$$

$$- : \frac{1}{26}$$

$$3 \times \text{BP: } \frac{-6}{20}$$

$$9 \times \text{LP: } \frac{-18}{2}$$

$$1 \times \text{LP: } \frac{-2}{0}$$



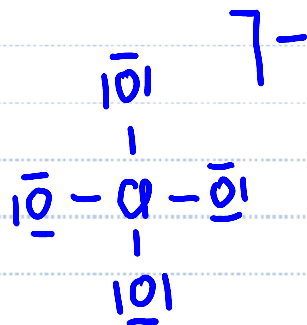
$$\text{Cl: } 7$$

$$\text{O: } 4 \times 6$$

$$- : \frac{1}{32}$$

$$4 \times \text{BP: } \frac{-8}{24}$$

$$12 \times \text{LP: } \frac{-24}{0}$$



### Notes

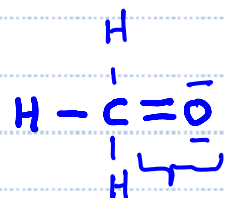
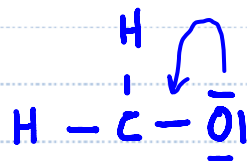
- Negative charge increases the valence electron total.
- Positive charge decreases the valence electron total.
- Ions always enclosed by parenthesis.

## 8.2 Lewis Structures

### B: Drawing Lewis Structures – Shortage of Electrons – Multiple Bonds



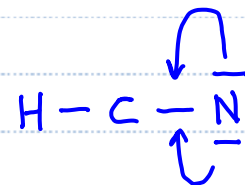
$$\begin{array}{r}
 \text{H:} \quad 2 \times 1 \\
 \text{C:} \quad 4 \\
 \text{O:} \quad 6 \\
 \hline
 12 \\
 3 \times \text{BP:} \quad -6 \\
 \hline
 6 \\
 3 \times \text{LP:} \quad -6 \\
 \hline
 0
 \end{array}$$



C & O both members  
of ENOPS



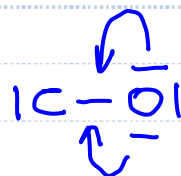
$$\begin{array}{r}
 \text{H:} \quad 1 \\
 \text{C:} \quad 4 \\
 \text{N:} \quad 5 \\
 \hline
 10 \\
 2 \times \text{BP:} \quad -4 \\
 \hline
 6 \\
 3 \times \text{LP:} \quad -6 \\
 \hline
 0
 \end{array}$$



C & N both members  
of ENOPS



$$\begin{array}{r}
 \text{C:} \quad 4 \\
 \text{O:} \quad 6 \\
 \hline
 10 \\
 1 \times \text{BP:} \quad -2 \\
 \hline
 8 \\
 3 \times \text{LP:} \quad -6 \\
 \hline
 2 \\
 1 \times \text{LP} \quad -2 \\
 \hline
 0
 \end{array}$$



### Notes

Multiple bonds employed when after all the valence electrons have been distributed, the central atom does not have an octet, provided the following ....

... There is an atom attached that has a lone pair of electrons. You may use this lone pair to make a multiple bond provided both atoms belong to the ENOPS club.

Carbon, Nitrogen, Oxygen, Phosphorus, Sulfur

