

## Announcements – Lecture XII – Friday, June 6<sup>th</sup>

1. Fourth Lab: **Tuesday, June 10<sup>th</sup>, ISB 155 (A-C)**
2. Exam II: **Friday, June 13<sup>th</sup>, In Class**



# Quiz 9

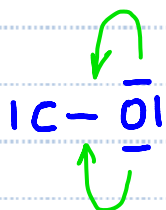
Class #: \_\_\_\_\_

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

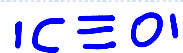
Draw the Lewis Dot Structure for the following molecules.

CO

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

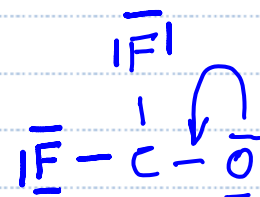


C & O ... CNOPS

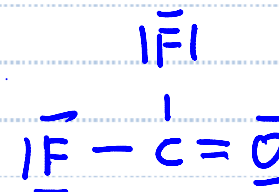


F<sub>2</sub>CO

$$\begin{array}{r} \text{F:} \quad 2 \times 7 \\ \text{C:} \quad 4 \\ \text{O:} \quad 6 \\ \hline 24 \\ 3 \times \text{BP:} \quad -6 \\ \hline 18 \\ 9 \times \text{LP} \quad -18 \\ \hline 0 \end{array}$$



C & O ... CNOPS  
F not in CNOPS



## 8.2 Lewis Structures

### D: Drawing Lewis Structures – Multiple Bonds and Resonance



N: 5  
O: 3x6  
-: 1  

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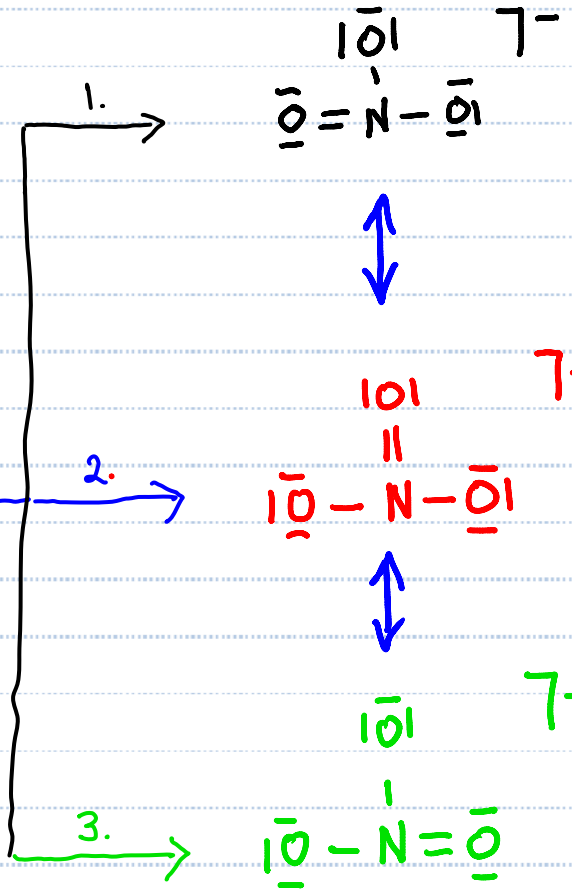
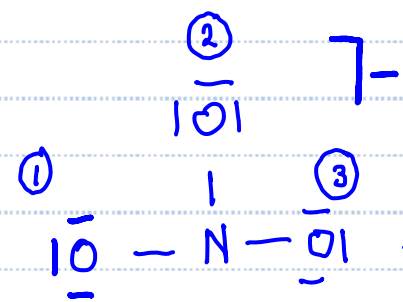
24  
3x6P: -6  

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18  
9xLP -18  

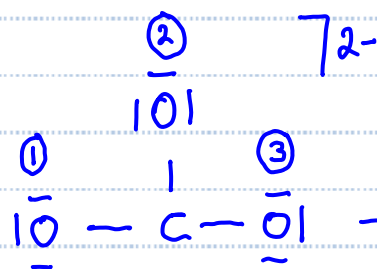
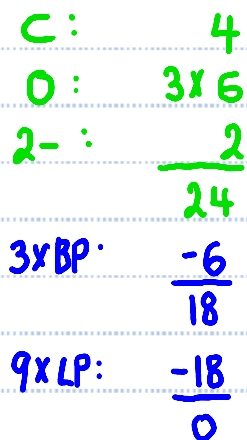
---

0

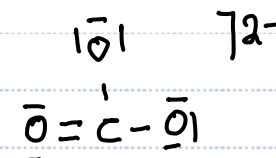


## 8.2 Lewis Structures

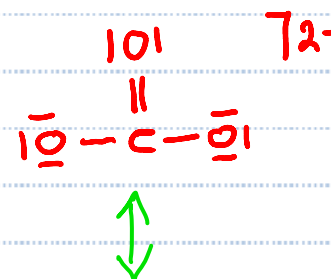
### D: Drawing Lewis Structures – Multiple Bonds and Resonance



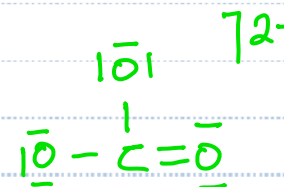
1. →



2. →



3. →

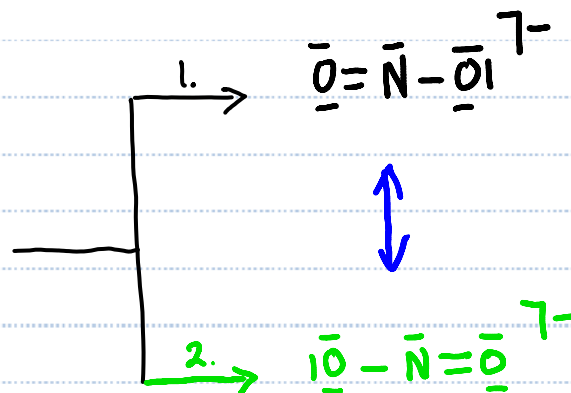
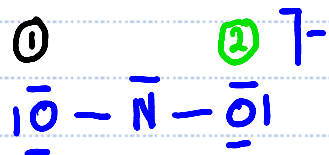


## 8.2 Lewis Structures

### D: Drawing Lewis Structures – Multiple Bonds and Resonance



$$\begin{array}{r} \text{N:} \quad 5 \\ \text{O:} \quad 2 \times 6 \\ \text{---:} \quad 1 \\ \hline 18 \\ 2 \times \text{BP:} \quad -4 \\ \hline 14 \\ 6 \times \text{LP:} \quad -12 \\ \hline 2 \\ 1 \times \text{LP:} \quad -2 \\ \hline 0 \end{array}$$



## Notes

a) Use  $\longleftrightarrow$  to denote that a set of Lewis Structures are resonance structures

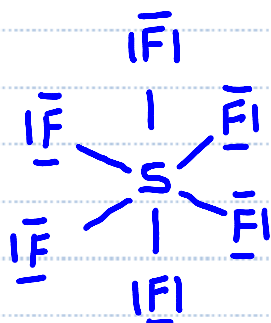
b) Note that Resonance Structures are not 'real' structures, they are in fact extremes. The actual structure is the weighted average of all reasonable resonance structures.

## 8.2 Lewis Structures

### C: Exceptions to the Octet Rule

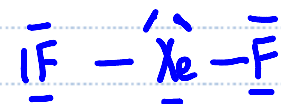
SF<sub>6</sub>

$$\begin{array}{r}
 \text{S:} \quad 6 \\
 \text{F:} \quad 6 \times 7 \\
 \quad \quad 48 \\
 6 \times \text{BP:} \quad -12 \\
 \quad \quad \quad 36 \\
 18 \times \text{LP:} \quad -36 \\
 \quad \quad \quad \quad 0
 \end{array}$$



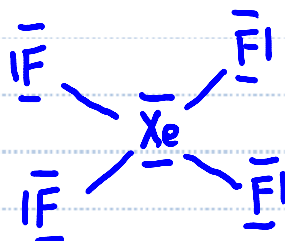
XeF<sub>2</sub>

$$\begin{array}{r}
 \text{Xe:} \quad 8 \\
 \text{F:} \quad 2 \times 7 \\
 \quad \quad 14 \\
 2 \times \text{BP:} \quad -4 \\
 \quad \quad \quad 18 \\
 6 \times \text{LP:} \quad -12 \\
 \quad \quad \quad \quad 6! \\
 3 \times \text{LP} \quad -6 \\
 \quad \quad \quad \quad 0
 \end{array}$$



XeF<sub>4</sub>

$$\begin{array}{r}
 \text{Xe:} \quad 8 \\
 \text{F:} \quad 4 \times 7 \\
 \quad \quad 28 \\
 4 \times \text{BP:} \quad -8 \\
 \quad \quad \quad 20 \\
 12 \times \text{LP:} \quad -24 \\
 \quad \quad \quad \quad 4 \\
 2 \times \text{LP:} \quad -4 \\
 \quad \quad \quad \quad 0
 \end{array}$$



Notes

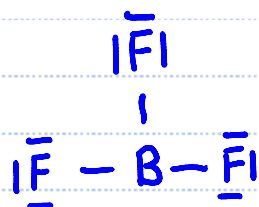
o) 'Beyond the octet' is seen only when the central atom is period 3 or greater.

## 8.2 Lewis Structures

### C: Exceptions to the Octet Rule

**BF<sub>3</sub>**

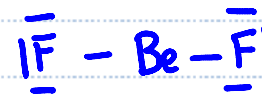
$$\begin{array}{r} \text{B: } 3 \\ \text{F: } 3 \times 7 \\ \hline 24 \\ 3 \times \text{BP: } -6 \\ \hline 18 \\ 9 \times \text{LP: } -18 \\ \hline 0 \end{array}$$



No multiple bond as neither  
B nor F belong to CNOPS

**BeF<sub>2</sub>**

$$\begin{array}{r} \text{Be: } 2 \\ \text{F: } 2 \times 7 \\ \hline 16 \\ 2 \times \text{BP: } -4 \\ \hline 12 \\ 6 \times \text{LP: } -12 \\ \hline 0 \end{array}$$



## 8.2 Lewis Structures

### C: Organic Molecules



How many C-H bonds are there in  $C_2H_6O$

- a) 3      d) 6 ✓  
 b) 4      e) Help  
 c) 5 ✓

C:  $2 \times 4$

H:  $6 \times 1$

O:  $6$

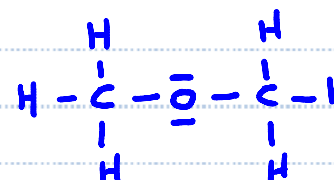
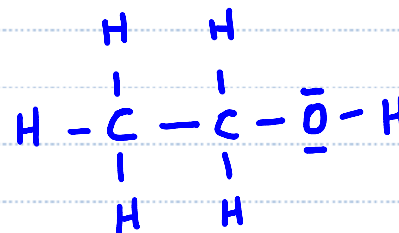
$20$

8x8P:  $-16$

$4$

2x4P:  $-4$

$0$



How do I know which one? Does it matter?

## Notes

C: 4 Bond pairs      0 lone pairs

N: 3 Bond pairs      1 lone pair

O: 2 Bond pairs      2 lone pairs

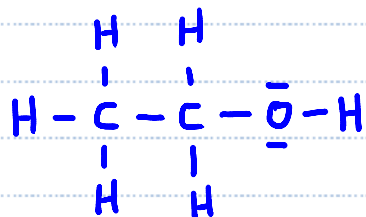
Halogens: 1 Bond pair      3 lone pairs

H: 1 Bond pair

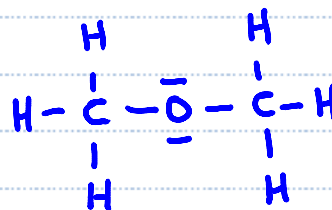


## 8.2 Lewis Structures

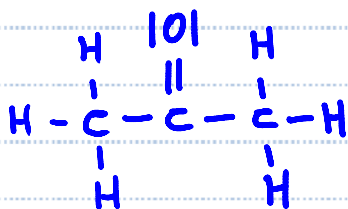
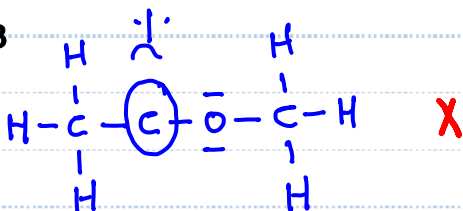
### C: Organic Molecules



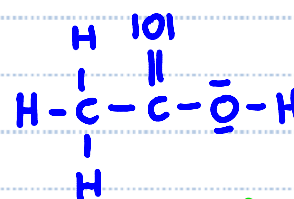
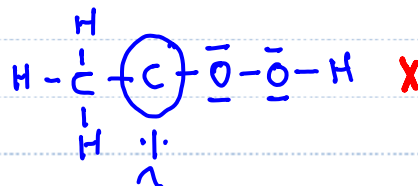
Ethanol: Boiling Point,  $78.4^\circ\text{C}$



Dimethyl ether: Boiling Point,  $-23^\circ\text{C}$



Ketone .. Acetone



Carboxylic acid  
Acetic acid.