

## Announcements – Lecture XI – Tuesday, Oct 18<sup>th</sup>

### 1. Third Lab – Saturday, October 22<sup>nd</sup> ... 1-4pm ... ISB 155/160 (A-E)

a) *Print lab prior to coming to lab -- use the 'Print Friendly Version' located on the top left hand side of the page – this is the version that contains the 'Data Sheet' that you will hand in upon completing the lab.*

b) *Second set of Lab Owls will appear in Owl after this lab. There are a total of 4 sets of Lab Owls and they are worth 25% of the Lab Grade.*

### 2.



**iClicker:**

*Choose any letter: A-E*

### 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

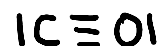
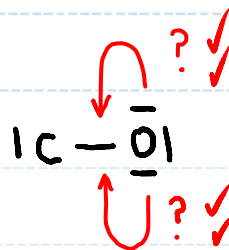
#### CO Class Homework Exercise.

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



↳ Central atom.

least electronegative.



#### Notes

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

- 1) There is a terminal atom with at least one lone pair of electrons and ...
- 2) Both atoms forming the multiple bond are members of CNOPS.

↳ Carbon, Nitrogen, Oxygen, Phosphorus and Sulfur.

## 3.9

## What is Resonance?

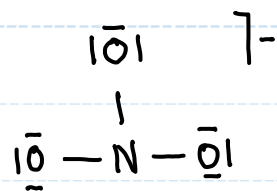
## Drawing Lewis Structures of Covalent Compounds

## Group IV:

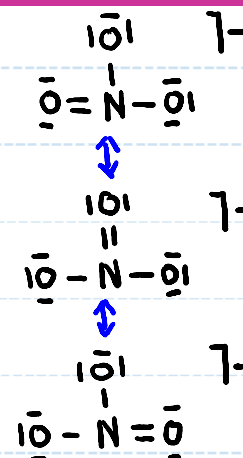
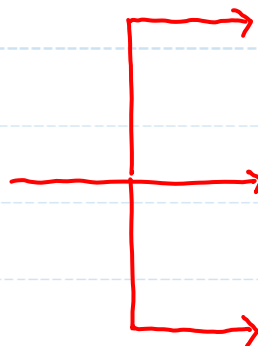
## Choices When Forming Multiple Bonds ... Resonance



$$\begin{array}{r}
 \text{N: } 5 \\
 \text{O: } 3(6) \\
 \text{-: } 1 \\
 \hline
 24 \\
 3 \times \text{BP} \quad -6 \\
 \hline
 18 \\
 9 \times \text{LP} \quad -18 \\
 \hline
 0
 \end{array}$$



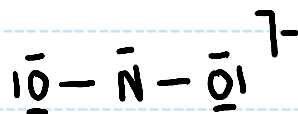
3 choices



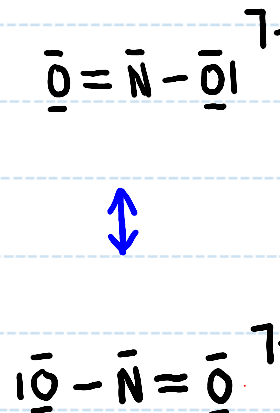
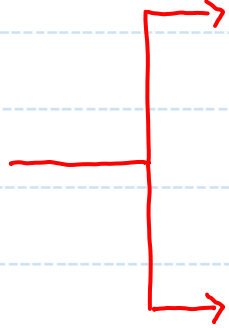
↔ Denotes that the structures are Resonance structures.



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



2 choices



## 3.9

## What is Resonance?

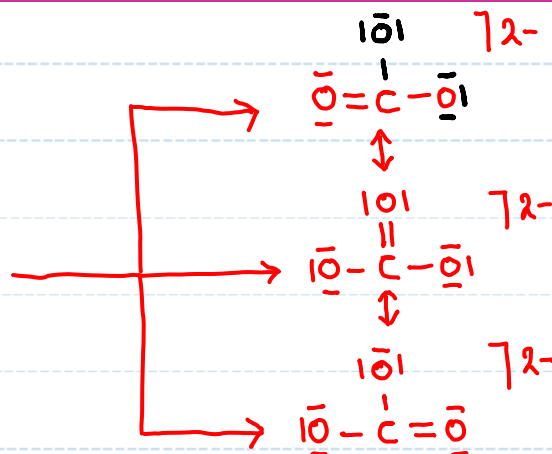
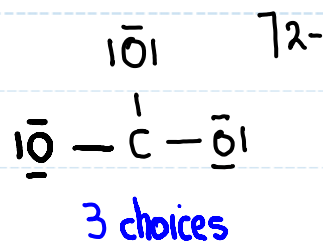
## Drawing Lewis Structures of Covalent Compounds

## Group IV:

## Choices When Forming Multiple Bonds ... Resonance



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

Notes

- 1)  $\leftrightarrow$  used to denote that a set of Lewis Structures are Resonance Structures.
- 2) Resonance Structures are not "real" structures - they are extremes - the actual structure is the weighted average of all the **reasonable** Resonance Structures.

3.7  
C

What Is a Covalent Bond and How Does One Form?  
Multiple Bonds – Resonance?

F<sub>2</sub>CO

F: 2(7)

C: 4

O: 6

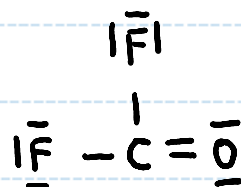
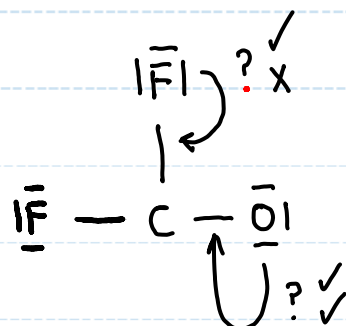
24

3x BP -6

18

9x LP -18

0



How many equivalent Lewis structures are necessary to describe the bonding in F<sub>2</sub>CO

a) 0

b) 1 ✓

c) 2

d) 3

e) Help

## 3.7

## C

## Group V:

## What Is a Covalent Bond and How Does One Form?

## Drawing Lewis Structures of Covalent Compounds

## Organic Molecules



C: 2(4)

H: 6(1)

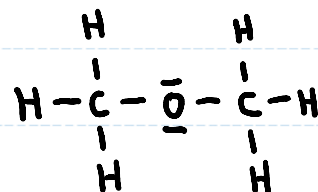
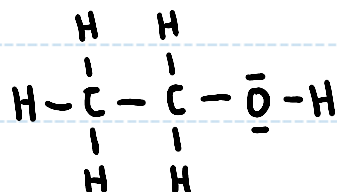
O: 6

8xBP -16

4

2xLP -4

0



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

a) 3

b) 4

c) 5 ✓

d) 6 ✓

e) Help



How do I know which one?

Does it matter?

Notes

When dealing with organic molecules we can assume with some degree of certainty that the "Octet Rule" is not violated and thus:

C: 4 bonds, 0 lone pairs.

H: 1 bond.

N: 3 bonds, 1 lone pair.

O: 2 bonds, 2 lone pairs.

Halides: 1 bond, 3 lone pairs.

