

## Announcements – Lecture IX – Thursday, Oct 8<sup>th</sup>

### 1. Third Lab – Saturday, October 24<sup>th</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. No Class on Tuesday, October 13<sup>rd</sup> – Academic Monday

3.

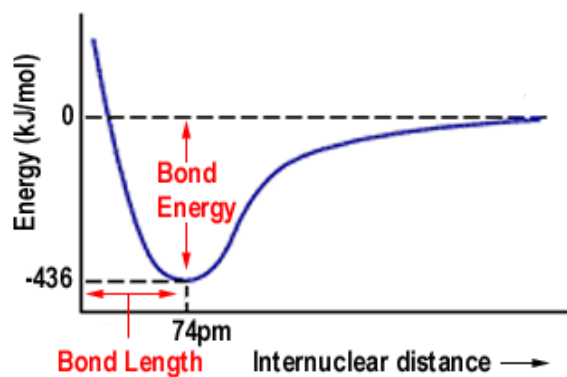


iClicker:

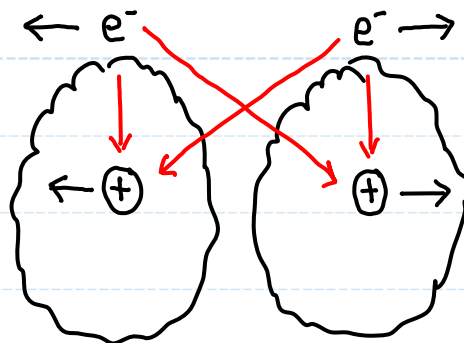
*Choose any letter: A-E*

### 3.7 A

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



See animation on class web site.



Con:

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

Pro:

- a) electron/proton attraction.

### 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

#### CH<sub>4</sub>

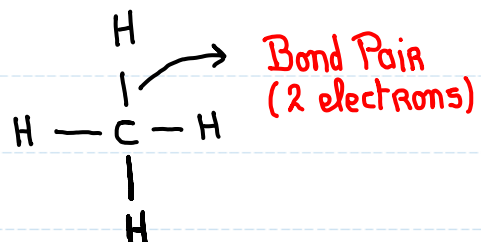
$$\text{C: } 4$$

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

$$8$$

$$4 \times \text{BP} \quad \underline{-8}$$

$$0$$



BP = Bond Pair

#### NH<sub>3</sub>

$$\text{N: } 5$$

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

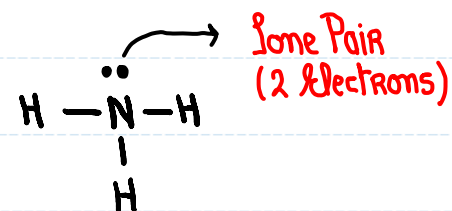
$$8$$

$$3 \times \text{BP} \quad \underline{-6}$$

$$2$$

$$1 \times \text{LP} \quad \underline{-2}$$

$$0$$



LP = lone Pair

#### H<sub>2</sub>O

$$\text{O: } 6$$

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

$$8$$

$$2 \times \text{BP} \quad \underline{-4}$$

$$4$$

$$2 \times \text{LP} \quad \underline{-4}$$

$$0$$



#### SiF<sub>4</sub>

$$\text{Si: } 4$$

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

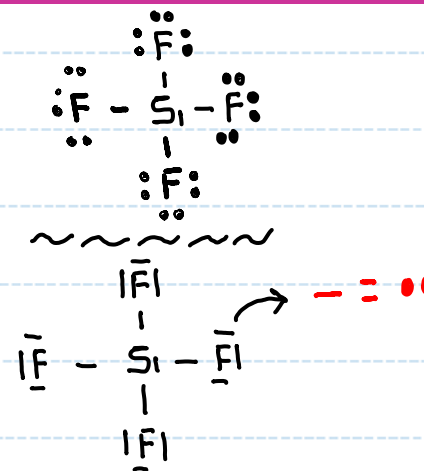
$$32$$

$$4 \times \text{BP} \quad \underline{-8}$$

$$24$$

$$12 \times \text{LP} \quad \underline{-24}$$

$$0$$



### 3.7

### C

### Group I:

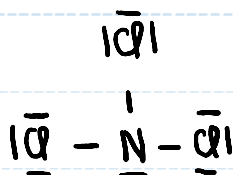
## What Is a Covalent Bond and How Does One Form?

### Drawing Lewis Structures of Covalent Compounds

### Bond Pair and Lone Pair Electrons



$$\begin{array}{r} \text{N: } 5 \\ \text{Cl: } 3(7) \\ \hline 26 \\ 3 \times \text{BP} \quad -6 \\ \hline 20 \\ 9 \times \text{LP} \quad -18 \\ \hline 2 \\ 1 \times \text{LP} \quad -2 \\ \hline 0 \end{array}$$



# 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 ... — = ••

## 3.7

C

Group II:

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

Drawing Lewis Structures of Covalent Compounds

Dealing With Charges



N: 5

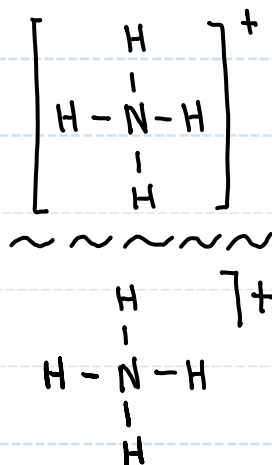
H: 4(1)

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

8

4xBP  $\frac{-8}{}$

0



Cl: 7

O: 3(6)

-:  $\frac{1}{}$

26

3xBP  $\frac{-6}{}$

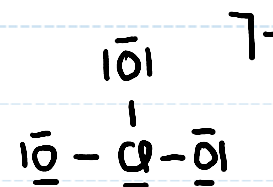
20

9xLP  $\frac{-18}{}$

2

1xLP  $\frac{-2}{}$

0



Cl: 7

O: 4(6)

-:  $\frac{1}{}$

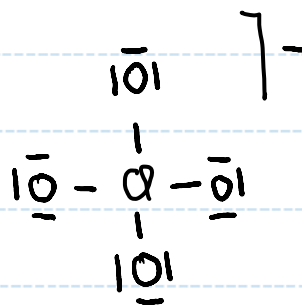
32

4xBP  $\frac{-8}{}$

24

12xLP  $\frac{-24}{}$

0

Notes

- 1) Negative charges increase the valence electron total.
- 2) Positive charges decrease the valence electron total.
- 3) Use parenthesis. Either [ ] or  $^+$ .

## 3.7

## C

## Group III:

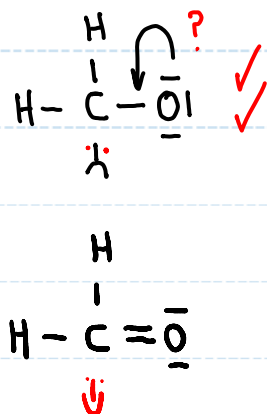
## What Is a Covalent Bond and How Does One Form?

## Drawing Lewis Structures of Covalent Compounds

## Shortage of Electrons ... Multiple Bonds



H:	2(1)	
C:	4	
O:	6	
	12	
3x BP	-6	
	6	
3x LP	-6	
	0	



? = Two questions.

- 1). Do you have a terminal atom with at least one lone pair on it?
- 2). Are both atoms that are about to form a multiple bond members of CNOPS?

If yes to both questions, then a multiple bond can be made.



H:	1	
C:	4	
N:	5	
	10	
2x BP	-4	
	6	
3x LP	-6	
	0	

