

Announcements – Lecture IX– Thursday, Oct 13^h



Please pick up handout.

Where is Prof Whelan ?!!

Who are you ?

Prof Beatrice Botch

3.7 Shared
C
Group I: pair of e⁻

What Is a Covalent Bond and How Does One Form?
Drawing Lewis Structures of Covalent Compounds
 Bond Pair and Lone Pair Electrons

One of
MOST VALUABLE
techniques will learn

CH₄ Key - Count VALENCE e⁻

C 4
H 1x4
8 valence e⁻

4x BP = 8

0 All valence e⁻ used for bonding

NH₃

N: 5
H: 1x3
8

3x BP = 6
2
8

1x LP = 2
0

Lone Pair (2 e⁻)

8e⁻

Octet Stable

LP = Lone Pair

H₂O

O: 6
H: 1x2
8

2x BP = 4
4
8

2x LP = 4
0

SiF₄

Si: 4 (j)

F: 7x4
32

4x BP = 8
24

Si + F Octets (j)

3.7

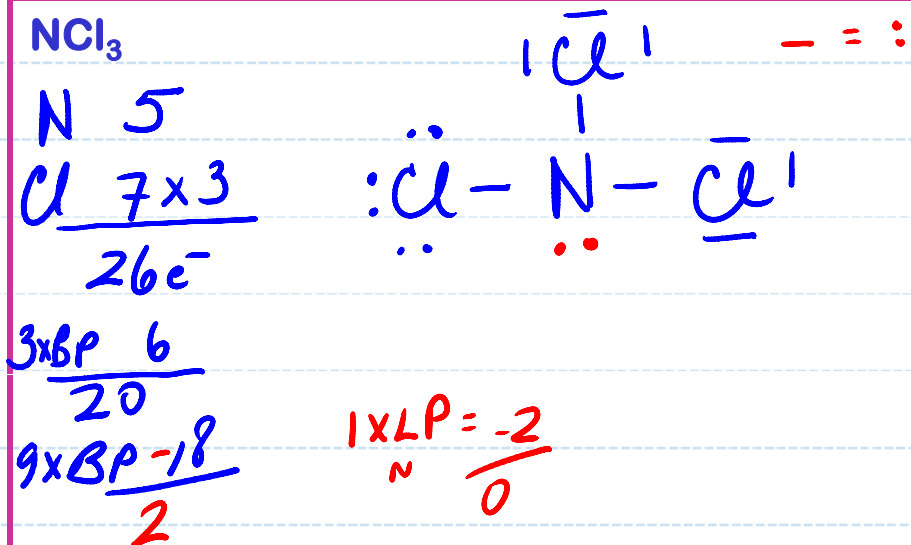
C

Group I:

What Is a Covalent Bond and How Does One Form?

Drawing Lewis Structures of Covalent Compounds

Bond Pair and Lone Pair Electrons



Lone pairs on Cl?

- a) 1
b) 9 Total
c) 3 on each Cl



Notes

- 1 Central atom. Usually first Least electronegative Why? Shares e⁻ best
2. H always terminal. 1 Bond - 2 electrons
- 3 All other atoms → octet 8 electrons
4. Complete octets of terminal atoms 1st. Then Central
5. Be able to distinguish between BP + LP
6. Acceptable shorthand - or ..



3.7

What Is a Covalent Bond and How Does One Form?

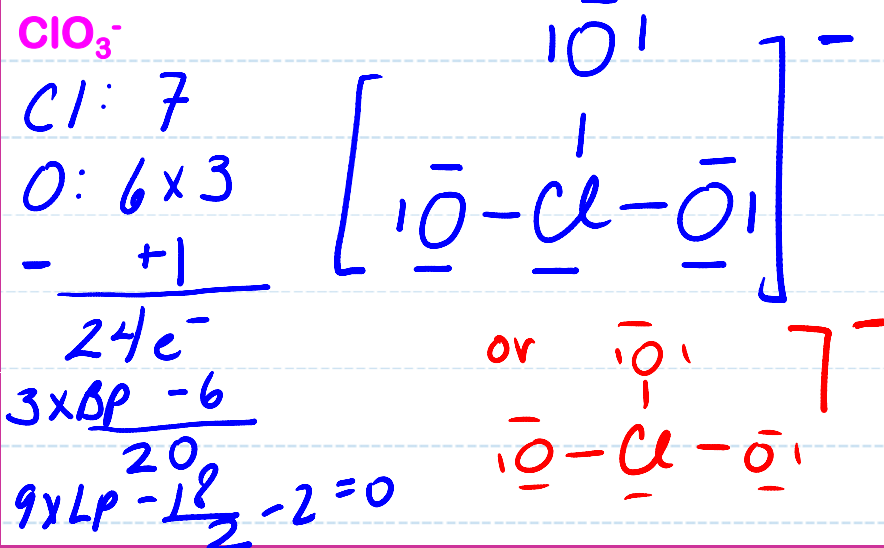
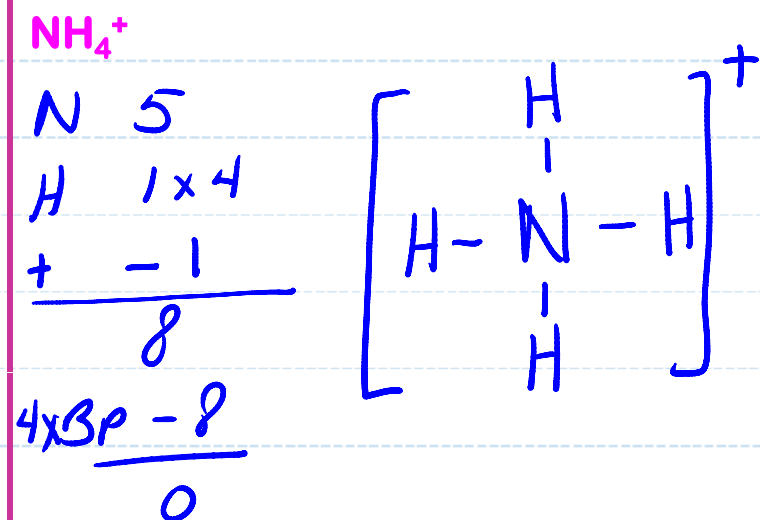
C

Drawing Lewis Structures of Covalent Compounds

Group II:

Dealing With Charges

Molecular Ions Polyatomic Ions



ClO_4^-

Class homework exercise

Notes

1. Positive charge
Decrease valence e⁻
2. Negative charge
Increase valence e⁻
3. Use $[]^{\text{charge}}$
or $\left. \vphantom{[]^{\text{charge}}} \right]_{\text{charge}}$

3.7

What Is a Covalent Bond and How Does One Form?

C

Drawing Lewis Structures of Covalent Compounds

Group III:

Shortage of Electrons \rightarrow Multiple Bonds H_2CO Central atom?

H 1x2

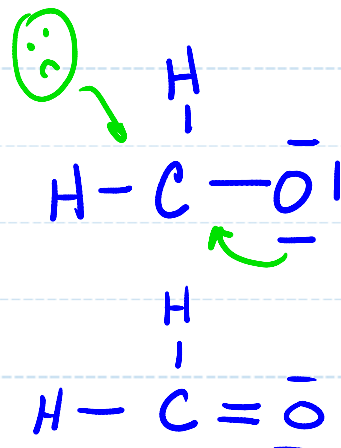
C 4

O 6

12

3x BP - 6

6

Shortage of e^- on central atom

Multiple Bond if

1. Terminal atom with 1 or more LP
2. Both atoms can form multiple bond CNOPS

HCN

How many bonds between C and N?

H 1

C 4

N 5

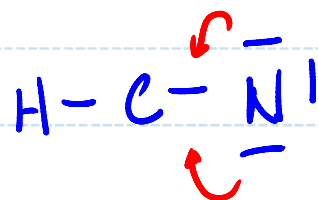
10e⁻

2x BP - 4

6

3x LP - 6

0



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

CO

Class homework exercise

Notes

- Form multiple bonds to central atom if:
1. Distribute all e^- & central has INCOMPLETE OCTET
 2. Terminal atom has 1 or more Lone pairs of electrons
 3. Both central & terminal member of CNOPS
Carbon, Nitrogen, Oxygen, Phosphorus, Sulfur

3.7

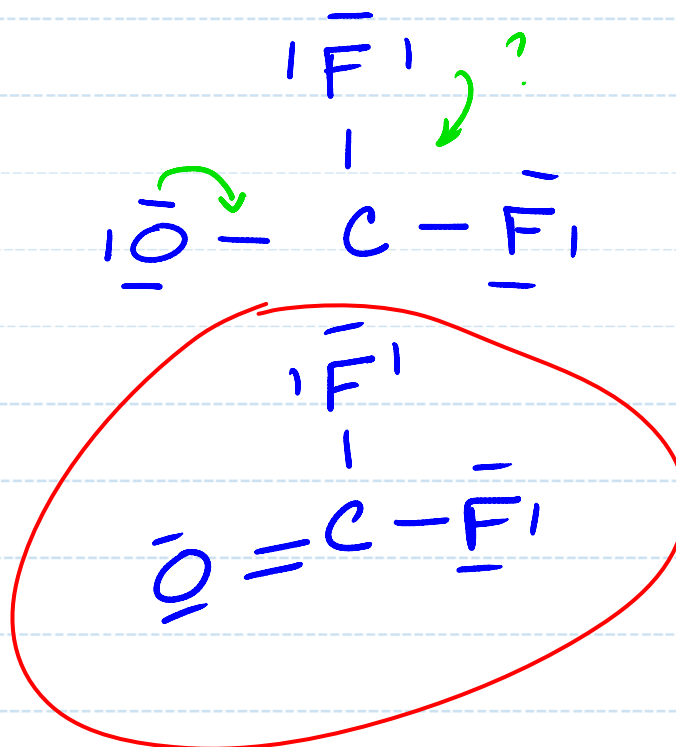
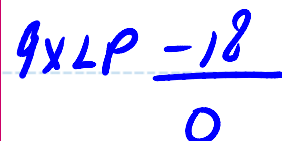
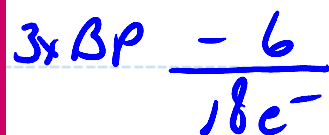
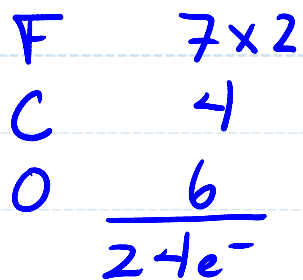
What Is a Covalent Bond and How Does One Form?

C

Drawing Lewis Structures of Covalent Compounds

Group III:

Shortage of Electrons ... Multiple Bonds

 $T < 2:00?$ F_2CO (Not on Worksheet)

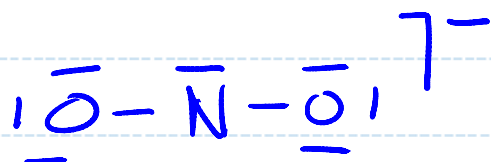
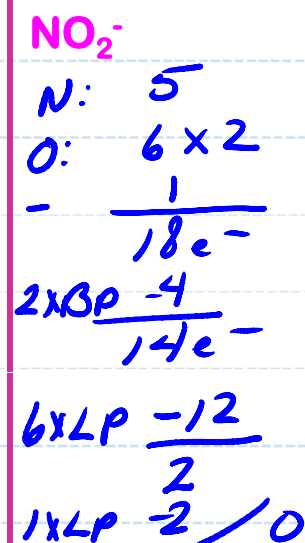
3.9

What is Resonance?

Drawing Lewis Structures of Covalent Compounds

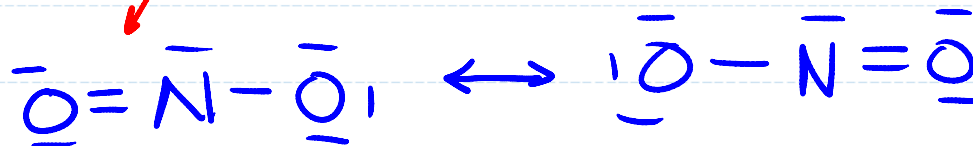
Group IV:

Choices When Forming Multiple Bonds ... **Resonance**

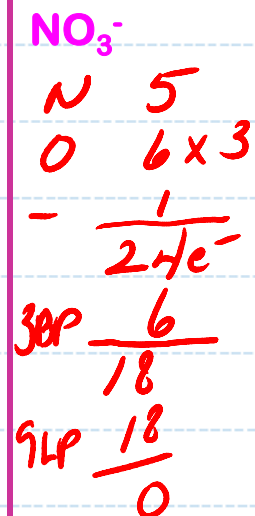


2 choices

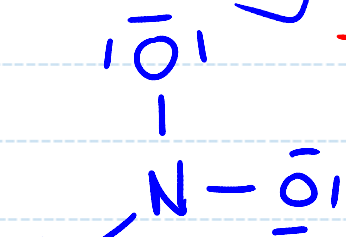
Actual Structure
 Mixture of 2
 Each N-O $1\frac{1}{2}$



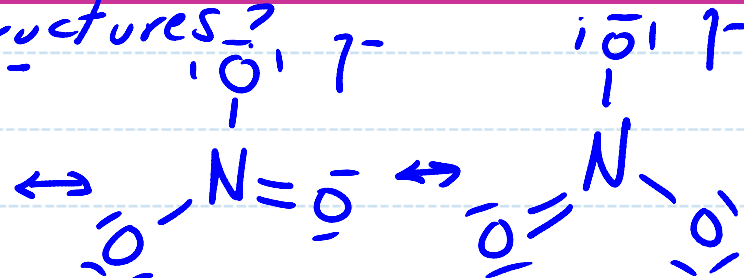
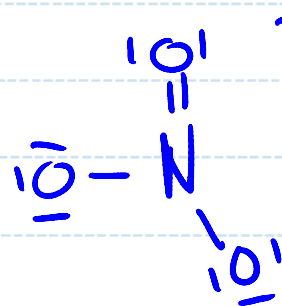
Term used: Resonance hybrid



How many equivalent structures?



3 choices



3.9

What is Resonance?

Drawing Lewis Structures of Covalent Compounds

Group IV:

Choices When Forming Multiple Bonds ... Resonance



Class homework exercise

Resonance occurs when there is more than one

Notes Way to represent multiple bonding in a Molecule or Ion.

1. Use \longleftrightarrow to represent resonance structures
2. Resonance structures are not "real". Extremes. Molecule is a mixture (hybrid) of all resonance structures possible