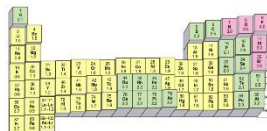
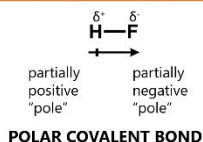


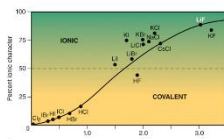
Electronegativity and Lewis Structure Practice

ELECTRONEGATIVITY

Electronegativity (χ) – ability of an element to attract bonding electrons



Usually polar covalent bonds are between atoms with $\Delta\chi = 0.5 - 1.9$. High difference in electronegativity between the atoms leads to unequal sharing of electron pair.



LEWIS STRUCTURE:

1. Determine total number of valence electrons
2. Any charges? YES – add (-ve charge)/subtract (+ve charge)
3. Build skeleton structure (incomplete Lewis Structure)
4. Group 14,15,16 atoms usually “central”
5. Hydrogen and Group 17 atoms “terminal”
6. Make multiple bonds only when necessary
7. Check - Noble gas electronic configuration at each atom?

CALCULATING FORMAL CHARGE:

- 1) Draw Lewis Structure
- 2) Determine neutral valence of each atom (number of valence electrons)
- 3) Assign each atom half of bonding electrons + lone pairs
- 4) FC = Neutral Valence – Assigned electrons

Shape of Molecules (Only electron groups 2, 3, and 4)

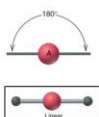
VSEPR (Valence Shell Electron Pair Repulsion) Theory

2 Electron Groups: 1 geometry

LINEAR

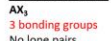


2 bonding groups
No lone pairs
Ex. CO_2



3 Electron Groups: 2 geometries

TRIGONAL PLANAR



BENT



e^- Group arrangement (no. of groups)

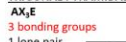


4 Electron Groups: 3 geometries

TETRAHEDRAL



TRIGONAL PYRAMIDAL



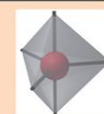
BENT



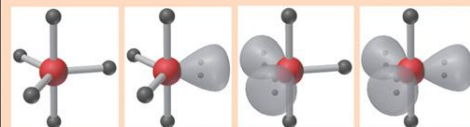
Molecular shape (class)

No. of bonding groups

Bond angle



Trigonal bipyramidal (5)



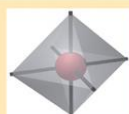
Molecular shape (class)	Trigonal bipyramidal (AX_5)	Seesaw (AX_4E)	T shaped (AX_3E_2)	Linear (AX_2E_3)
No. of bonding groups	5	4	3	2
Bond angle	90° (ax) 120° (eq)	<90° (ax) <120° (eq)	<90° (ax)	180°

e^- Group arrangement (no. of groups)

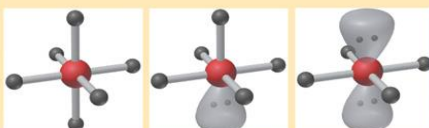
Molecular shape (class)

No. of bonding groups

Bond angle



Octahedral (6)



Molecular shape (class)	Octahedral (AX_6)	Square pyramidal (AX_5E)	Square planar (AX_4E_2)
No. of bonding groups	6	5	4
Bond angle	90°	<90°	90°

Review

Question 1

- A. Draw the Lewis Structure and identify the formal charge on carbon in the bicarbonate ion (HCO_3^-). Show calculation for the formal charge.

- B. Draw the Lewis structure for HCN, CH_2NH , and CH_3NH_2 . (Note: All contain a Carbon-Nitrogen bond)

Which molecule to you expect to have the shortest nitrogen-to-carbon bond? Why?

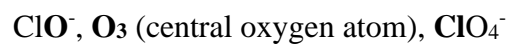
Question 2

Arrange the following (Explain your answer – show Lewis structures and geometry where applicable)

1. From lowest to highest bond angle



2. From lowest to highest formal charge on the atom that is bolded (consider the most stable Lewis structure only)



Question 3

- a) Draw the Lewis structure(s) for $[\text{CH}_2\text{CHCH}_2\text{CN}]$. The molecule has a C-C-C-C-N skeleton. Include lone pairs in your answer.

- b) Calculate formal charge for N in the structure(s) drawn.

- c) Indicate electron groups and the molecular geometry around each carbon.

from left to right:

Question 4

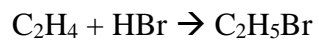
- a) Draw the Lewis structure(s) for H_2SO_3 and SO_3^{2-} . Include lone pairs in your answer. Indicate all non zero formal charge on the atoms.

- b) Which of the two (H_2SO_3 or SO_3^{2-}) has equivalent resonance structures? Show all equivalent resonance structures for that molecule

Question 5

- a. Draw all possible resonance structures for CH_3NCO .
- b. Give the formal charge on each atom with a non-zero formal charge.
- c. Which of the resonance structures is most contributing? Explain why?

Question 6



In the above reaction, determine the shape of the molecule (around either of the carbons atom) in the reactant and compare that to the shape of the product.

Question 7

For each of the following compare the electron geometry (total electron groups) and molecular geometry (shape of the molecule) around:

a. Central oxygen atom for : H_3O^+ ; OH^- ; H_2O

b. Central carbon atom for: CH_3^+ ; CH_4 ; CH_3^-