

Name _____ Partner Name _____

Section _____

Experiment 10: Molecular Polarity Lab Report form Visit <https://phet.colorado.edu/en/simulation/molecule-polarity>

Part 1: 2 atom system (part 1 - # 1 to #5 and analysis)

- (a) For the molecule A—B (1) draw the dipole moment vector arrow and (2) the δ^+ and δ^- between A and B when A is **LESS** electronegative and B is **MORE** electronegative
- (b) For the molecule A—B (1) draw the dipole moment vector arrow and (2) the δ^+ and δ^- between A and B when A is **MORE** electronegative and B is **LESS** electronegative

Part 2: 3 atom system (BENT) A—B—C (Part 2 #1 to #6 and analysis)

- (a) For the molecule A—B—C (1) draw the individual dipole moment vector arrow and (2) the δ^+ and δ^- between A, C and B (3) draw the dipole moment arrow for the vector sum when A, C is **LESS** electronegative and B is **MORE** electronegative
- (b) For the molecule A—B—C (1) draw the dipole moment vector arrow and (2) the δ^+ and δ^- between A, C and B (3) draw the dipole moment arrow for the vector sum when A, C is **MORE** electronegative and B is **LESS** electronegative

3 atom system (LINEAR) A—B—C (Part 2 #7 to #9 and analysis)

- (a) For the molecule A—B—C (1) draw the individual dipole moment vector arrow and (2) the δ^+ and δ^- between A, C and B (3) draw the dipole moment arrow for the vector sum when A, C is **LESS** electronegative and B is **MORE** electronegative
- (b) For the molecule A—B—C (1) draw the dipole moment vector arrow and (2) the δ^+ and δ^- between A, C and B (3) draw the dipole moment arrow for the vector sum when A, C is **MORE** electronegative and B is **LESS** electronegative

Part 3 – Real Molecules: (p 128 text) Complete the following chart (# e = # valence electrons)

(use p. 120 Table 1 and p. 121 Table 2)

molecule	Lewis Structure	VSEPR Shape	predicted polarity	actual polarity	Electron Density
HF # e 8		linear			
O ₂ # e 16		linear			
H ₂ O #e 8		bent			
CO ₂ #e 16		linear			
HCN # e 10		linear			
NH ₃ # e 8		trigonal pyramidal			
BF ₃ #e 24		trigonal planar			
CH ₂ O # e 12		trigonal planar			
CH ₄ # e 8		tetrahedral			
CH ₃ F # e 14		tetrahedral			
CH ₂ F ₂ # e 20		tetrahedral			
CHF ₃ # e 26		tetrahedral			
CF ₄ # e 32		tetrahedral			

Questions: Do the ones requested by your lab instructor.

1. Which would have the greater O—N—O bond angle, NO₂ or NO₂⁺? Explain your answer.

2. Which of these molecules is/are polar? For each polar molecule, indicate the direction of dipole moment vector in the molecule (# e = # valence electrons) (Electronegativity table p. 121)

molecule	Lewis Structure	VSEPR Shape	Predicted polarity (show individual dipole moment arrow) (show vector sum arrow)
a. HBF ₂ # e 18		trigonal planar	
b. XeF ₂ # e 22		linear	
c. HCN # e 10		Linear	
d. H ₂ S # e 8		Bent	
e. FNO # e 18		bent	
f. S ₂ F ₂ # e 26		bent	
g. NH ₂ OH # e 14		trigonal pyramid (N), bent (O)	
h. SCl ₂ # e 20		bent	
i. BCl ₃ # e 24		Trigonal planar	

3. Give the electron pair and the molecular geometries for the following iodine containing compounds.

Molecule # e = # valence e	Lewis Structure	3 D drawing (--- , > , ---) behind plane front of plane in plane	Electron pair geometry name	Molecular geometry name
a. ICl_2^+ # e 20			tetrahedral (example)	bent (example)
b. I_3^- # e 22				
c. ICl_3 # e 28				
d. ICl_4^- # e 36				
e. IO_4^- # e 32				
f. IF_4^+ # e 34				
g. IF_5 # e 42				
h. IF_6^+ # e 48				