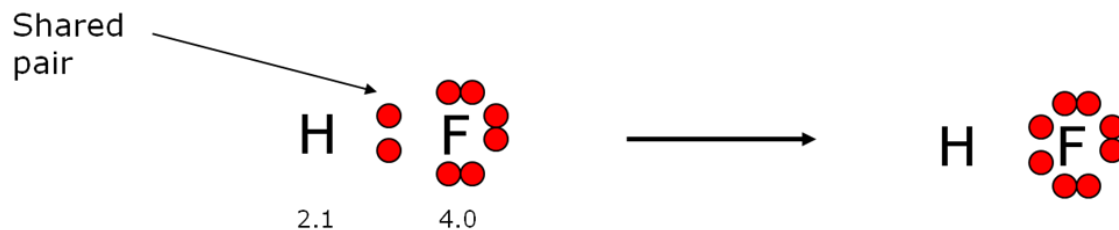


Topic 3: Polarity

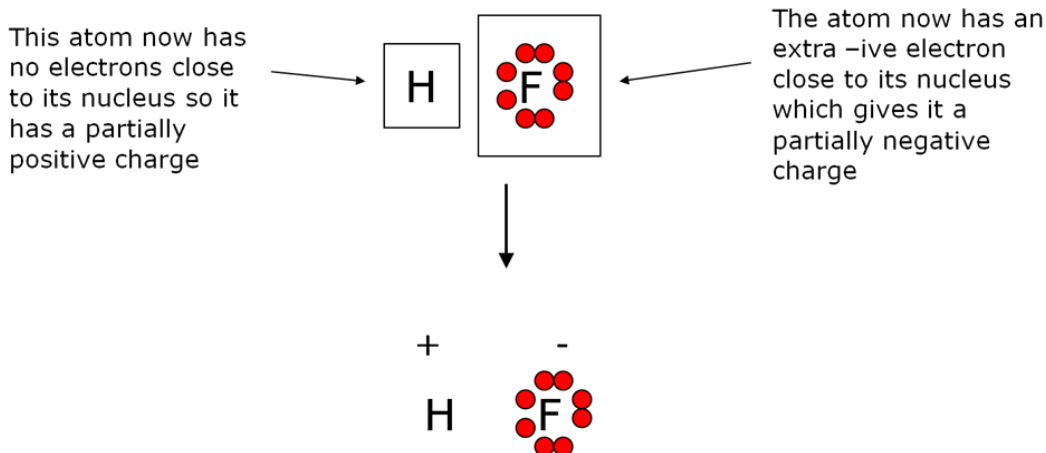
Electronegativity and Bond Polarity

- If two bonded atoms have different electronegativities, they will have unequal sharing of the shared pair of electrons

• E.g $\text{HF}_{(g)}$



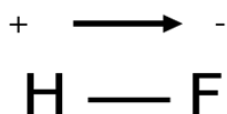
- Because the fluorine atom has a stronger attraction for electrons, it pulls the shared pair closer to its nucleus
- This unequal sharing gives the atoms partial charges



- Polar covalent bond
 - Covalent bond in which the two bonded atoms have a different electronegativity
 - Atoms unequally share electrons
- Non-polar covalent bond
 - Covalent bond in which the two bonded atoms have the same electronegativity
 - Atoms equally share electrons

Bond Dipoles

- We represent a polar bond with an arrow in the direction of the electron pull and the partial charge symbols



Draw bond dipoles for the following bonds



Polarity in Molecules

- Polar Molecule

+ive or

- A molecule in which the -ive charge is not distributed symmetrically among the molecule

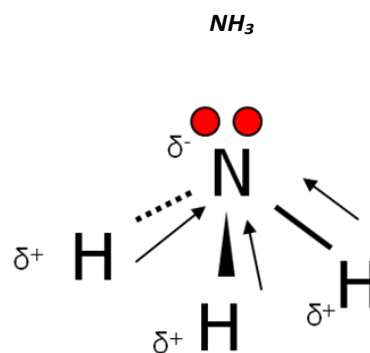
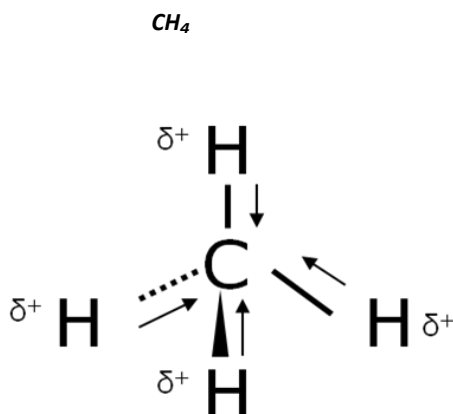
- Non-Polar Molecule

+ive or

- A molecule in which the -ive charge is distributed symmetrically among the molecule

- To determine if a molecule is polar

- Start by creating the VSEPR shape diagram
- Draw in bond dipoles



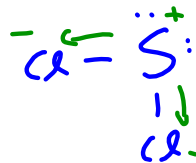
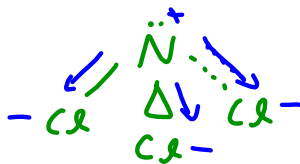
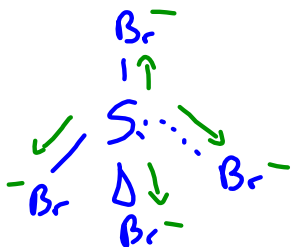
Practice Sheet 5

1. Predict the shape of the following molecules. Provide Lewis formulas and stereochemical formulas.

(a) silicon tetrabromide, $\text{SiBr}_4(\text{l})$

(b) nitrogen trichloride, $\text{NCl}_3(\text{l})$

(c) sulfur dichloride, $\text{SCl}_2(\text{l})$

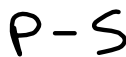


2. Predict the bond polarity for the following bonds. Use a diagram that includes the partial negative and positive charges and direction of the bond dipole:

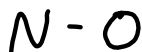
(a) C-N in hydrogen cyanide



(c) P-S in $\text{P}(\text{SCN})_3(\text{s})$



(b) N-O in nitrogen dioxide



(d) C-C in $\text{C}_8\text{H}_{18}(\text{l})$



3. Predict the polarity of the following molecules. Include a stereochemical formula, bond dipoles, and the final resultant dipole (if nonzero) of the molecule.

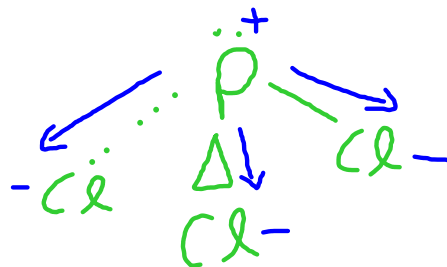
(a) carbon disulfide, $\text{CS}_2(\text{l})$



(b) oxygen difluoride, $\text{OF}_2(\text{g})$



(c) phosphorus trichloride, $\text{PCl}_3(\text{l})$



4. Use the empirical rules from Table 8, page 99, to predict the polarity of an octane, $\text{C}_8\text{H}_{18}(\text{l})$, molecule. Explain your answer without drawing the molecule

