Molecular Polarity
Covalently bonded molecules do not have an overall charge (number of protons = electrons), but can have areas/regions that are more positively or negatively charged, which creates an overall polarity for the molecule.

a. Polar example, HCl: H has electronegativity of 2.2; chlorine has a higher electronegativity of 3.16, so the electrons in the shared cloud are shifted toward Cl. A polar molecule results with the chlorine side being slightly more negative than hydrogen side.

b. Nonpolar example, O₂: The O’s have the same electronegativity, so the bond is nonpolar. Thus, the molecule is nonpolar.
   i. If all bonds are nonpolar, so is the molecule!

Some tips about polarity:
1. Not all polar bonds result in a polar molecule.
   a. If polar bonds are arranged symmetrically around the central atom, they offset overall for the whole molecule, therefore no regions of net negative or positive charges result.
2. Polar molecules must have polar bonds and 3-D asymmetry.
   a. There must be “lopsided” charge distribution because of either geometry or varying levels of electronegativity between atoms.
3. VSEPR molecular geometry table:
   a. If a molecule has equal polar bonds between atoms and no lone pairs, it is nonpolar. The molecule is symmetrical because it has no lone pairs around the central atom to make the molecule lopsided geometrically.
      i. Linear
         –Nonpolar if more than two atoms because there is nothing offsetting the pull for electrons.
         –Polar if there are only two atoms because of asymmetry.
      ii. Trigonal planar – nonpolar
      iii. Tetrahedral – nonpolar
   b. If a molecule has equal polar bonds and has lone pairs, it is polar.
      i. Pyramidal – polar
      ii. Bent – polar
4. If molecule has unequal polar bonds (multiple elements with varying electronegativity) then it is polar.
   a. A molecule with lopsided bonds or electronegativity is polar.
5. Polarity Decision Tree
   a. Three branches:
      i. Kinds of bonds (Polar or Nonpolar)
      ii. Geometry (symmetrical or assymmetrical)
      iii. Terminal Atoms (same or different)
6. Use of dipole moment arrows to help visualize polarity.
   a. Arrows point toward more electronegative atom.
   b. Determine if arrows offset each other in 3-D (electrons are shifted to one side of atom).

**Your Turn**
1. Draw the Lewis structure for SiH$_3$Cl.
2. Determine its geometry and bond angle.
3. Determine the hybridization of silicon.