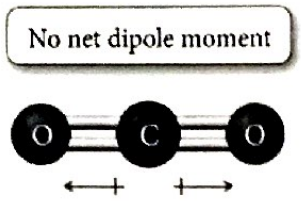
Molecular Polarity

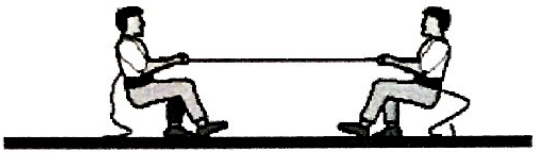
Just like bonds, molecules can be polar or non-polar.

Non-polar molecules: (**dipole moment =** ___∅___) either the bonds are non-polar, or the bond dipoles cancel out!

Examples: CO_2, CH_4, SiF_4

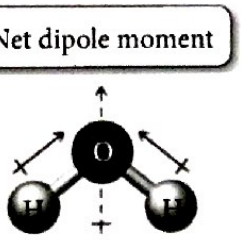


Think of dipoles like ___forces___: if two forces are pulling on the same object in **equal** but **opposite** directions, the object does ___NOT___ move → non-polar molecule!



Polar Molecules: Unequal distribution of electron density, because bond dipoles don't cancel , the presence of electron pairs, or both.

Examples: HCl, H_2O, CH_2F_2, PH_3



"Spatial asymmetry" of electron density = polar!

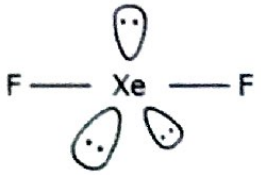
Determining Molecular Polarity

1. **If** ___lone pairs___ **are present on the central atom**, the molecular is **typically** ___polar___: lone pairs on the central atom make the molecule polar because their presence creates increased electron repulsion and thus, an unequal distribution of electron density.

   However, there are the following **exceptions**:

   a. **Trigonal bypyramidal** structures with three lone pairs (linear VSEPR).

      Example: XeF_2



   b. **Octahedral structures** with two lone pairs (square planar VSEPR)

      Example: XeF_4

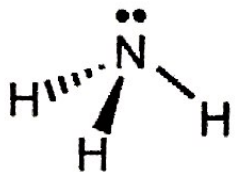
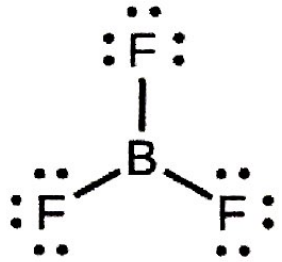
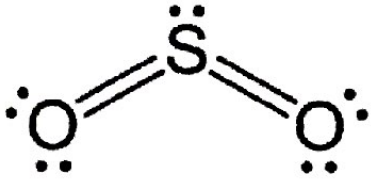
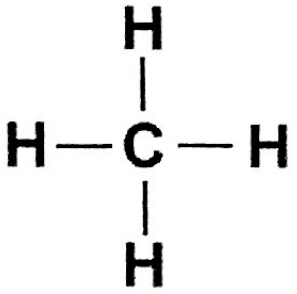
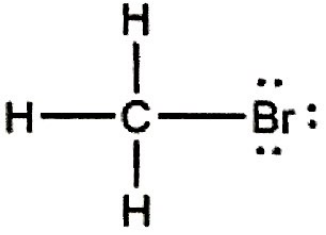
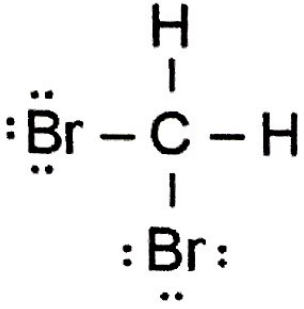
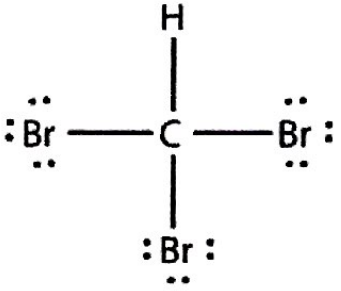
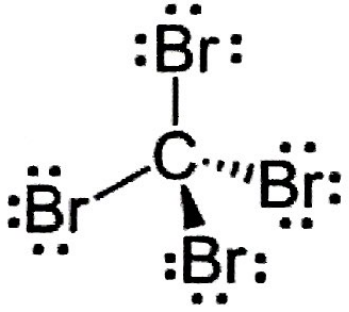
2. If lone pairs are ___NOT___ present on the central atom, and:

   a. **terminal** (non-central) **atoms are all the** ___same___, the molecule is ___non-polar___.

   b. **terminal** (non-central) **atoms are different,** the molecular is ___polar___.

Let's Practice!

Given the Lewis dot structures below, determine if the molecule is polar or non-polar.

1)  Is the molecule: polar or non-polar?	2)  Is the molecule: polar or non-polar?	3)  Is the molecule: polar or non-polar?	4)  Is the molecule: polar or non-polar?
5)  Is the molecule: polar or non-polar?	6)  Is the molecule: polar or non-polar?	7)  Is the molecule: polar or non-polar?	8)  Is the molecule: polar or non-polar?

And... Even More Practice!