

## SHAPES AND POLARITY OF MOLECULES

### Shapes: Valence-Shell Electron Pair Repulsion Theory (VSEPR)

1. Electron pairs around a central atom repel each other and move apart as far as possible.
2. Atoms assume a geometry dependent upon the electron pair geometry.

### Polarity

1. Bond dipoles point toward the more electronegative atom of the bond.
2. Bond dipoles are "added" up to determine the overall molecule dipole.
  - (a) If the bond dipoles cancel, the molecule is nonpolar.
  - (b) If bond dipoles do not cancel, the molecule is polar.

Number of e- pairs around the central atom	Electron pair geometry	Number of identical atoms around the central atom	Atom geometry	Examples	Polar Molecule? bond dipole ?? $\rightarrow$ ??
2	linear $: A :$ or $- A -$	2	linear	$CO_2$ $O=C=O$ $\leftarrow + \rightarrow$	<b>NO</b> (bond dipoles cancel)
3	planar triangular $\begin{array}{c} \cdot \cdot \\ \cdot A \cdot \\ \cdot \cdot \\ \cdot \cdot \end{array}$ or $\begin{array}{c} \diagup \\ A \\ \diagdown \\   \end{array}$ 	2	bent	$SO_2$ 	<b>YES</b> (bond dipoles add)
		3	planar triangular	$SO_3$ 	<b>NO</b> (bond dipoles cancel)
4	tetrahedral $\begin{array}{c} \cdot \cdot \\ : A : \\ \cdot \cdot \end{array}$ or $\begin{array}{c}   \\ - A - \\   \end{array}$ 	2	bent	$H_2O$ 	<b>YES</b> (bond dipoles add)
		3	pyramidal	$NH_3$ 	<b>YES</b> (bond dipoles add)
		4	tetrahedral	$CCl_4$ 	<b>NO</b> (bond dipoles cancel)