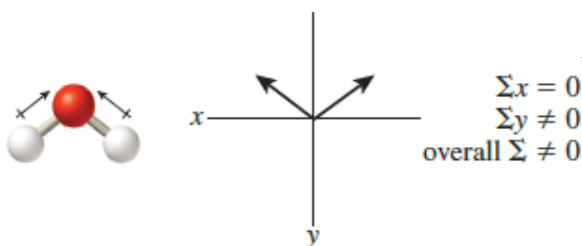


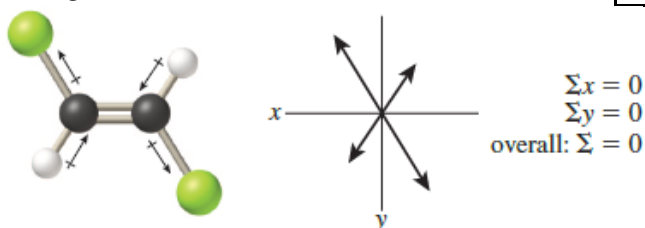
both the x and y directions, the molecule is nonpolar.



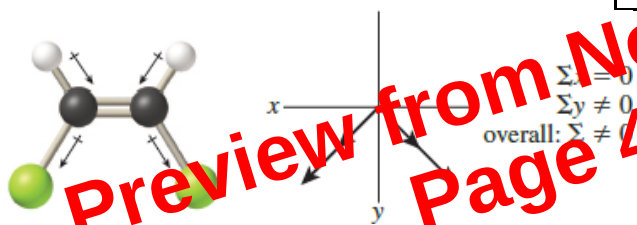
*Dipole moments can be used to distinguish between molecules that have the same chemical formula but different arrangements of atoms.

Because the individual bond dipoles sum to zero, the *trans* isomer is nonpolar.

Structural Isomer: molecules that have the same chemical formula but different arrangements of atoms



The bond dipoles in the *cis* isomers do *not* cancel one another, so the *cis* molecule is polar.



*All equivalent angles are ideal.

*Lone pairs repel bonds closer together so they are less than ideal.

*Double bonds repel more than single bonds so they are greater than ideal.

9.3: Valence Bond Theory

Bond Lengths and Bond Enthalpies of H₂, F₂, and HF

	Bond Length (Å)	Bond Enthalpy (kJ/mol)
H ₂	0.74	436.4
F ₂	1.42	150.6
HF	0.92	568.2

Valence Bond Theory: atoms share electrons when an atomic orbital on one atom overlaps with an atomic orbital on the other

- Each of the overlapping atomic orbitals must contain a single, unpaired electron.
- The two electrons shared by the bonded atoms must have opposite spins.
- The nuclei of both atoms are attracted to the shared pair of electrons.
- It is this mutual attraction for the shared electrons that holds the atoms together.

*A singly occupied orbital will appear as a light color and a doubly occupied orbital will appear as a darker version of that same color.

