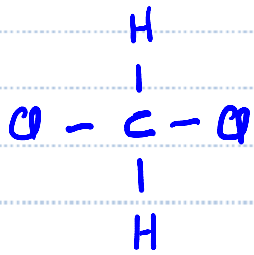
Announcements – Lecture XVII – Tuesday, June 17th

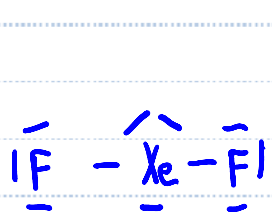
1. **Fifth Lab:** Today, ISB 155 (A-C)
   (The last set of Lab Owls)

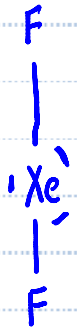
Quiz 13 Class #: ____ Last Name: _____

1. Label the following molecules as polar or nonpolar

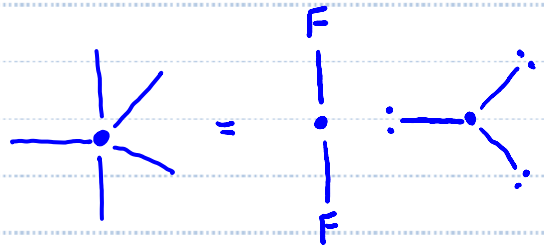


a) CH_2Cl_2 Polar





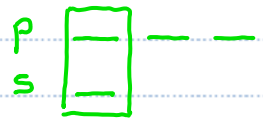
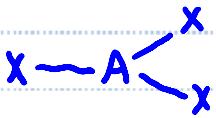
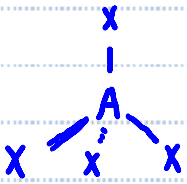
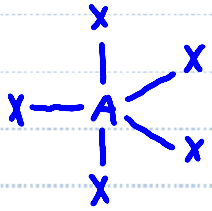
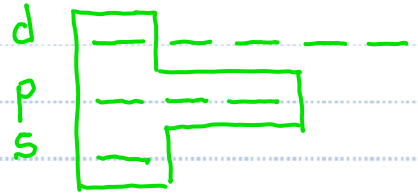
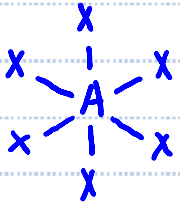
Remember



b) XeF_2 Non polar

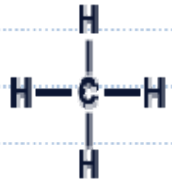
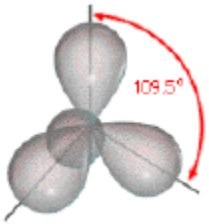
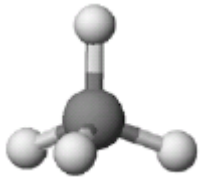
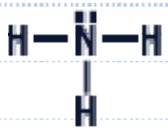
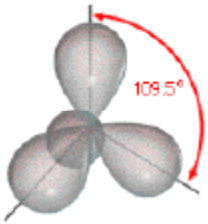
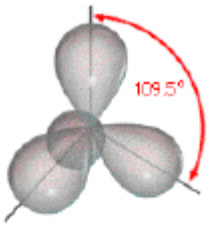
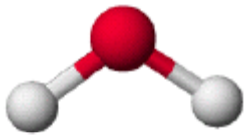
9.2 Hybrid Orbitals

A: Hybridization

Electron Pair Geometry	# Equivalent Orbitals Needed	Valence Orbitals Available	Hybrid Orbitals
X–A–X	2		2 x sp orbitals
	3		3 x sp^2 orbitals
	4		4 x sp^3 orbitals
	5		5 x sp^3d orbitals
	6		6 x sp^3d^2 orbitals

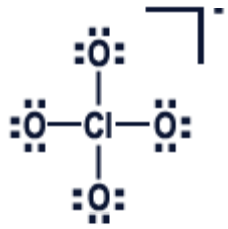
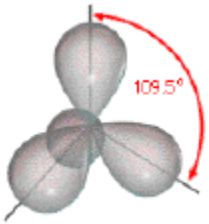
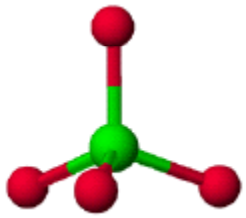
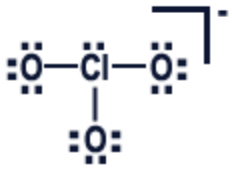
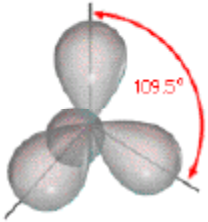
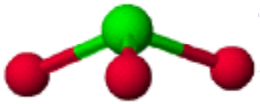
9.2 Hybrid Orbitals

B: sp^3 Hybridization

Lewis Structure	Class	Electron Pair Geometry	Molecular Geometry	Hybridization
CH_4 	AX_4E_0	 Tetrahedron	 Tetrahedron	sp^3
NH_3 	AX_3E_1	 Tetrahedron	 Trigonal pyramid	sp^3
H_2O 	AX_3E_1	 Tetrahedron	 Bent/Angular 109°	sp^3

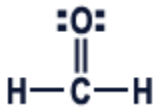
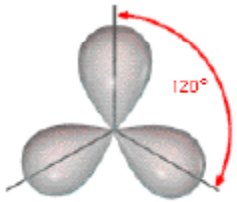
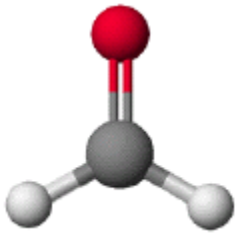
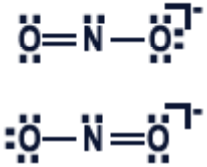
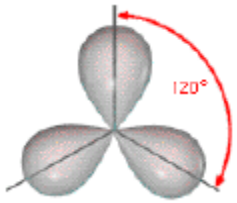
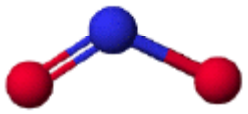
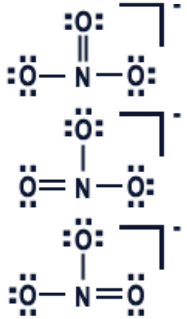
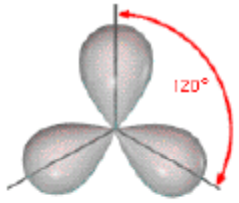
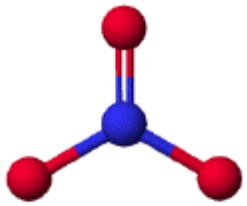
9.2 Hybrid Orbitals

B: sp^3 Hybridization

Lewis Structure	Class	Electron Pair Geometry	Molecular Geometry	Hybridization
ClO_4^- 	AX_4E_0	 Tetrahedron	 Tetrahedron	sp^3
ClO_3^- 	AX_3E_1	 Tetrahedron	 Trigonal pyramid	sp^3

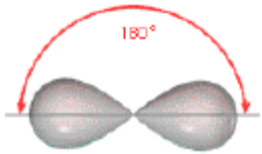
9.2 Hybrid Orbitals

C: sp^2 Hybridization

Lewis Structure	Class	Electron Pair Geometry	Molecular Geometry	Hybridization
H_2CO 	AX_3E_0	 Trigonal Planar	 Trigonal Planar	sp^2
NO_2^- 	AX_3E_1	 Trigonal Planar	 Bent/Angular 120°	sp^2
NO_3^- 	AX_3E_0	 Trigonal Planar	 Trigonal Planar	sp^2

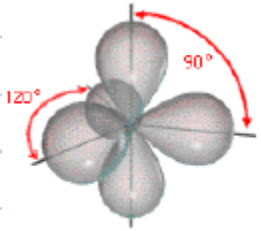
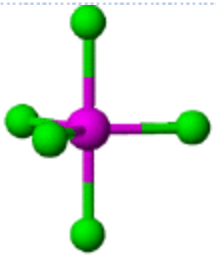
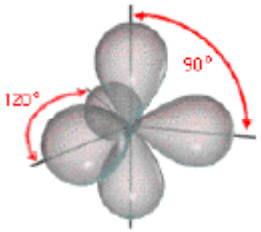
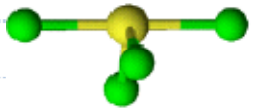
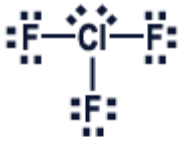
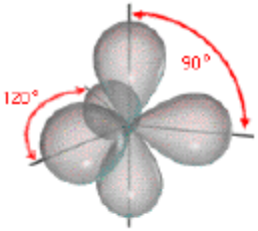
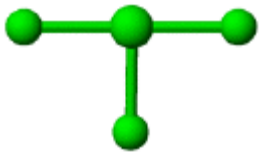
9.2 Hybrid Orbitals

D: sp Hybridization

Lewis Structure	Class	Electron Pair Geometry	Molecular Geometry	Hybridization
HCN H—C≡N:	AX_2E_0	 Linear	 Linear	sp

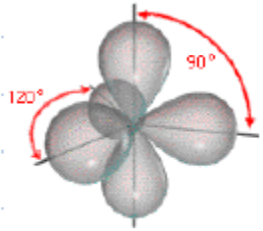
9.2 Hybrid Orbitals

E: sp^3d Hybridization

Lewis Structure	Class	Electron Pair Geometry	Molecular Geometry	Hybridization
PF_5 	AX_5E_0	 Trigonal Bipyramid	 Trigonal Bipyramid	sp^3d
SF_4 	AX_4E_1	 Trigonal Bipyramid	 Seesaw	sp^3d
ClF_3 	AX_3E_2	 Trigonal Bipyramid	 T-shaped	sp^3d

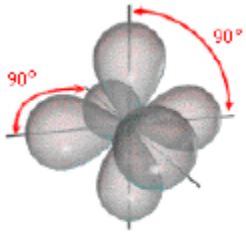
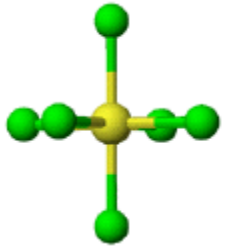
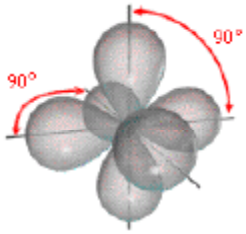
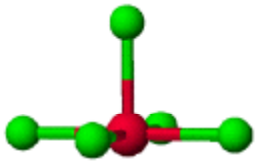
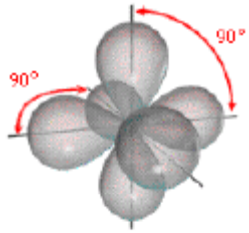
9.2 Hybrid Orbitals

E: sp^3d Hybridization

Lewis Structure	Class	Electron Pair Geometry	Molecular Geometry	Hybridization
XeF_2 	AX_2E_3	 Trigonal Bipyramid	 Linear	sp^3d

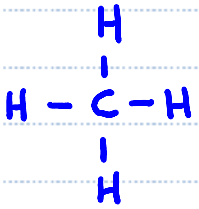
9.2 Hybrid Orbitals

F: sp^3d^2 Hybridization

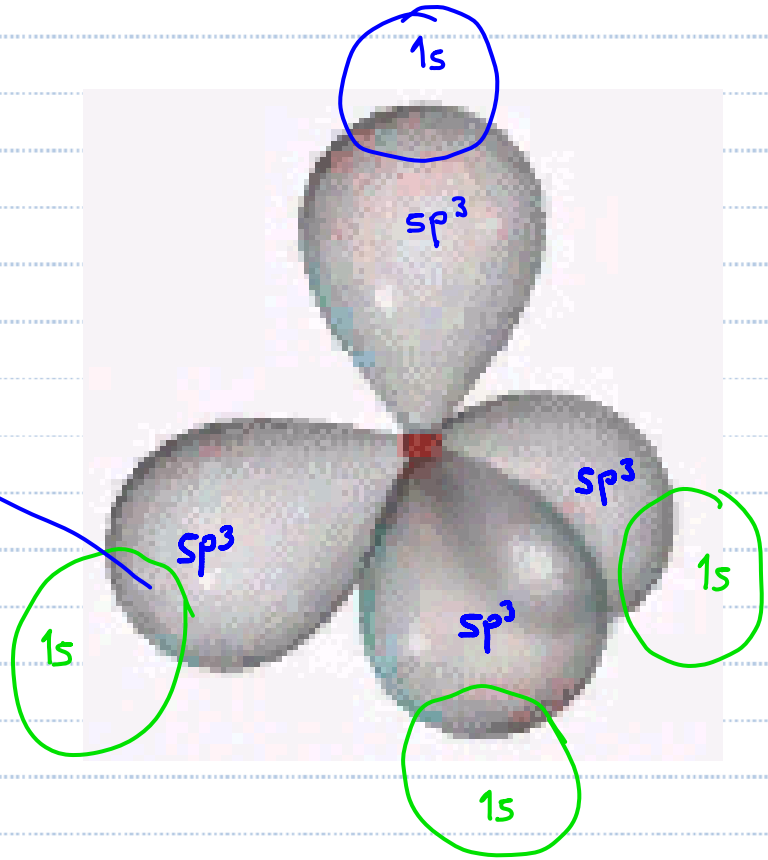
Lewis Structure	Class	Electron Pair Geometry	Molecular Geometry	Hybridization
SF_6 	AX_6E_0	 Octahedron	 Octahedron	sp^3d^2
BrF_5 	AX_5E_1	 Octahedron	 Square Pyramid	sp^3d^2
XeF_4 	AX_4E_2	 Octahedron	 Square Planar	sp^3d^2

9.3 Pi Bonds

Sigma Bonds – CH_4



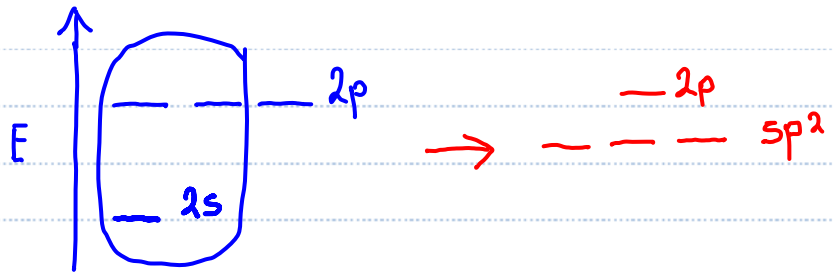
AX_4E_0 sp^3 hybrid orbitals



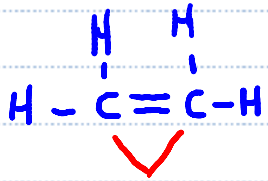
Sigma bond formed by the overlap of an sp^3 hybrid orbital on C with the 1s orbital on H.

9.3 Pi Bonds

B: Sigma Bonds – C_2H_4

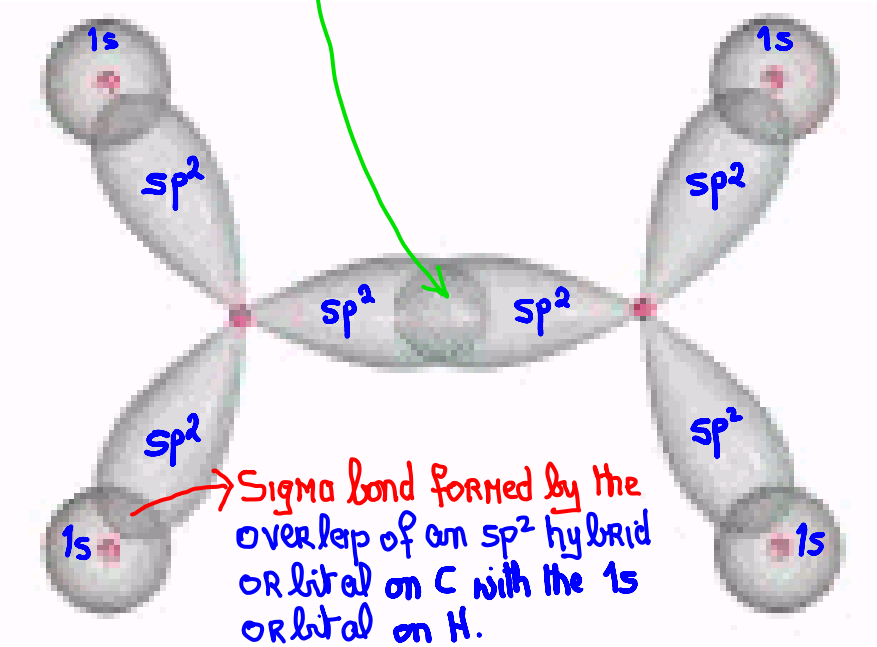


For both carbon atoms



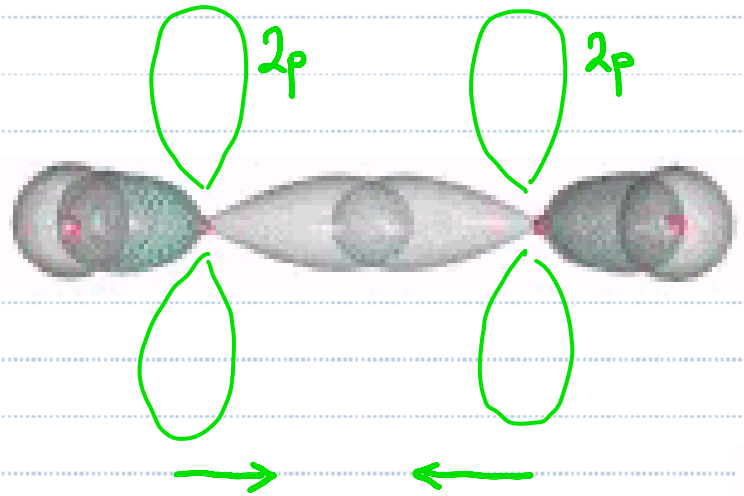
AX_3E_0 ... Trigonal planar ... sp^2

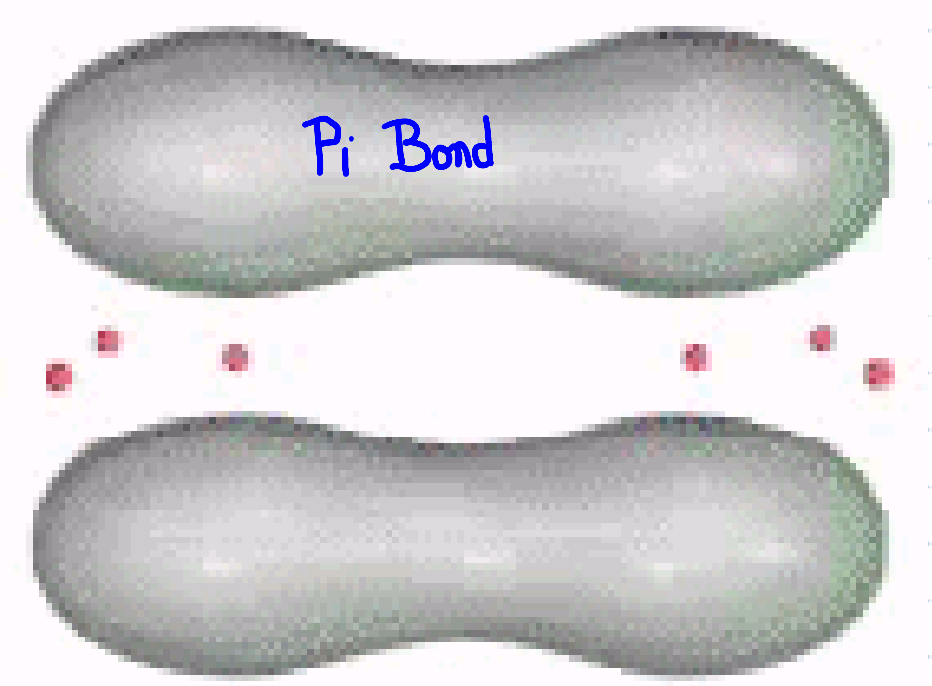
Sigma bond formed by the overlap of an sp^2 hybrid orbital on each of the carbon atoms.



9.3 Pi Bonds

B: Pi Bonds – C_2H_4





9.3 Pi Bonds

B: Sigma and Pi Bonds – C_2H_4