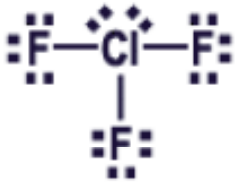
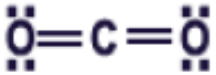
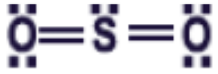
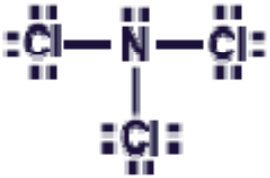
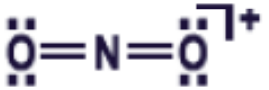
Announcements – Lecture XV – Wednesay, June 10th

1. Exam II: Friday, June 12th, In Class
2. Fifth Lab: Tuesday, June 16th , ISB 155B

Quiz 12 Class #: ____ Last Name: _____

A 	B 	C AX_2E_0 	D 
E AX_2E_1 	F AX_3E_0 	G AX_3E_1 	H AX_2E_0 

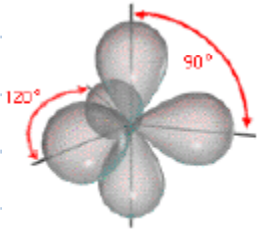
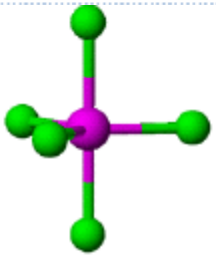
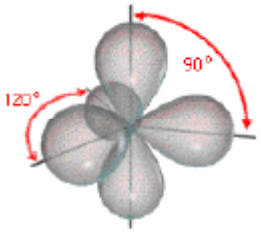
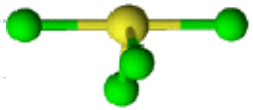
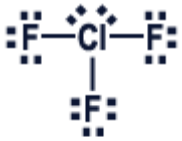
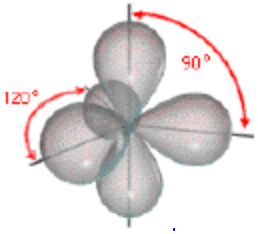
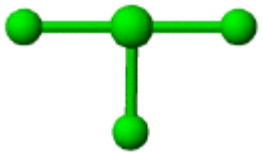
1. The **Electron Pair Geometry** of **C**: LINEAR
2. The **Molecular Geometry** of **G**: TRIGONAL PYRAMID
3. The **Bond Angle** around **S** in **E**: ~120°
4. The **molecule(s)** with a bond angle of **180°**: C, D, H

8.5 Valence-Shell Electron-Pair Repulsion and Molecular Shape

B: Electron Pair Geometries – Molecular Geometries

Trigonal Bipyramid

X+E = 5

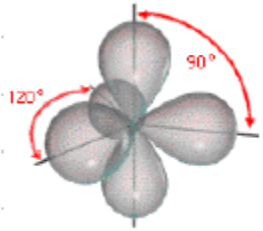
Lewis Structure	Class	Electron Pair Geometry	Molecular Geometry	Bond Angles
PF_5 	AX_5E_0	 TRIGONAL BIPYRAMID	 TRIGONAL BIPYRAMID	120°/90°
SF_4 	AX_4E_1	 TRIGONAL BIPYRAMID	 SEESAW	120°/90°
ClF_3 	AX_3E_2	 TRIGONAL BIPYRAMID	 T-SHAPED	90°

8.5 Valence-Shell Electron-Pair Repulsion and Molecular Shape

B: Electron Pair Geometries – Molecular Geometries

Trigonal Bipyramid

X+E = 5

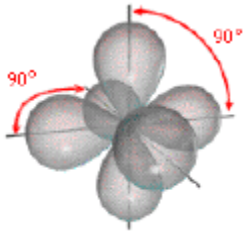
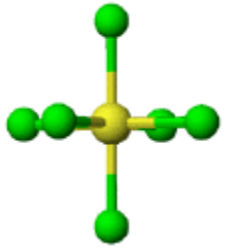
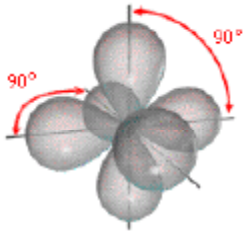
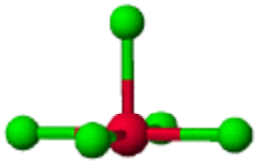
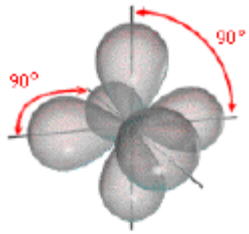
Lewis Structure	Class	Electron Pair Geometry	Molecular Geometry	Bond Angles
XeF_2 	AX_2E_3	 TRIGONAL BIPYRAMID	 LINEAR	180°

8.5 Valence-Shell Electron-Pair Repulsion and Molecular Shape

B: Electron Pair Geometries – Molecular Geometries

Octahedron

X+E = 6

Lewis Structure	Class	Electron Pair Geometry	Molecular Geometry	Bond Angles
SF_6 	AX_6E_0	 OCTAHEDRON	 OCTAHEDRON	90°
BrF_5 	AX_5E_1	 OCTAHEDRON	 SQUARE PYRAMID	90°
XeF_4 	AX_4E_2	 OCTAHEDRON	 SQUARE PLANAR	90°

8.5 Valence-Shell Electron-Pair Repulsion and Molecular Shape

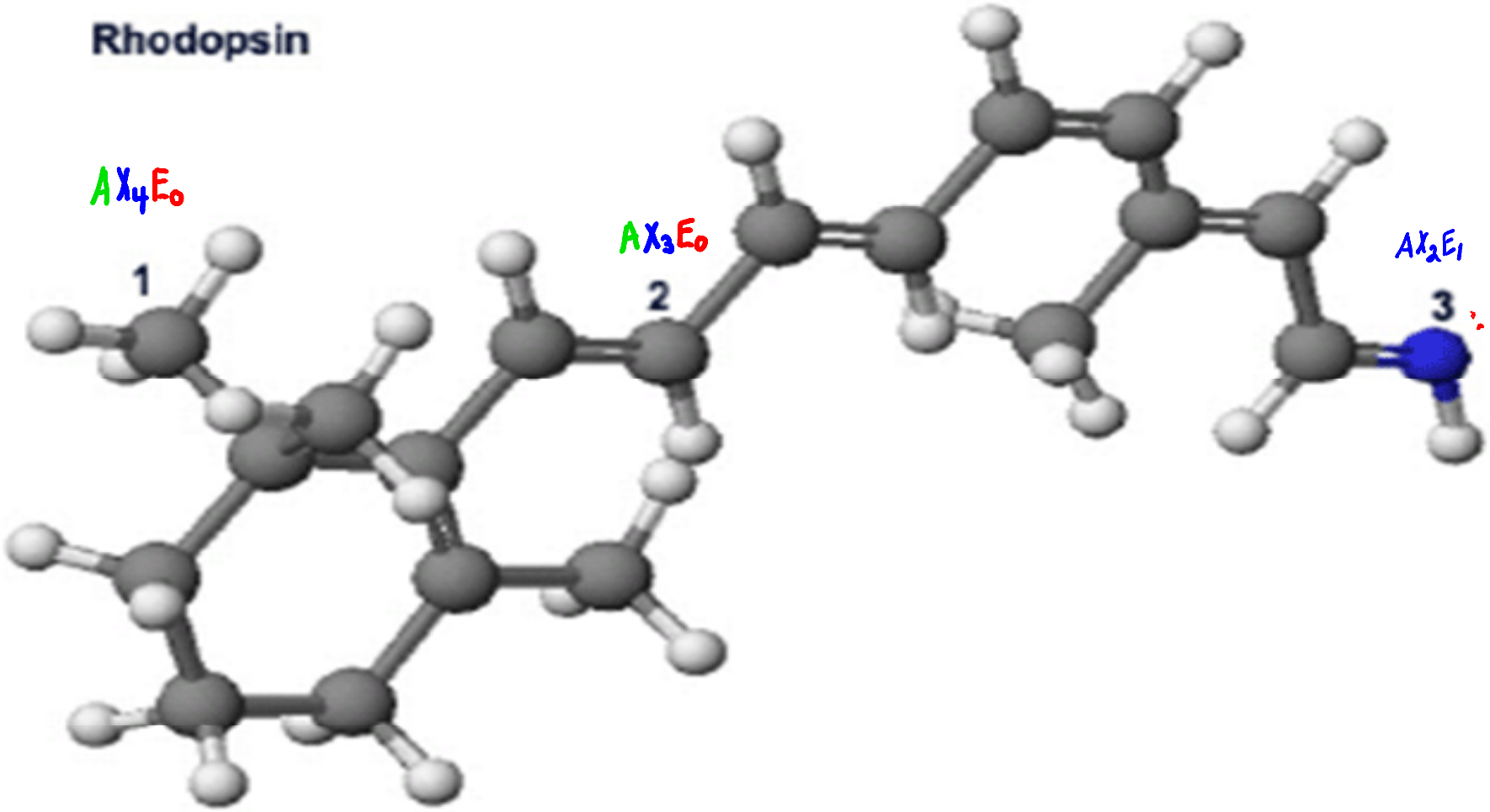
B: Electron Pair Geometries – Molecular Geometries

Summary

X+E	Electron Pair Geometry (Parent)	Molecular Geometry (Offspring)
3	Trigonal planar	E_0: Trigonal planar E_1: Angular/Bent (120°)
4	Tetrahedron	E_0: Tetrahedron E_1: Trigonal pyramid E_2: Angular/Bent (109°)
5	Trigonal bipyramid	E_0: Trigonal bipyramid E_1: Seesaw E_2: T-Shaped E_3: Linear
6	Octahedron	E_0: Octahedron E_1: Square pyramid E_2: Square planar

8.5 Valence-Shell Electron-Pair Repulsion and Molecular Shape

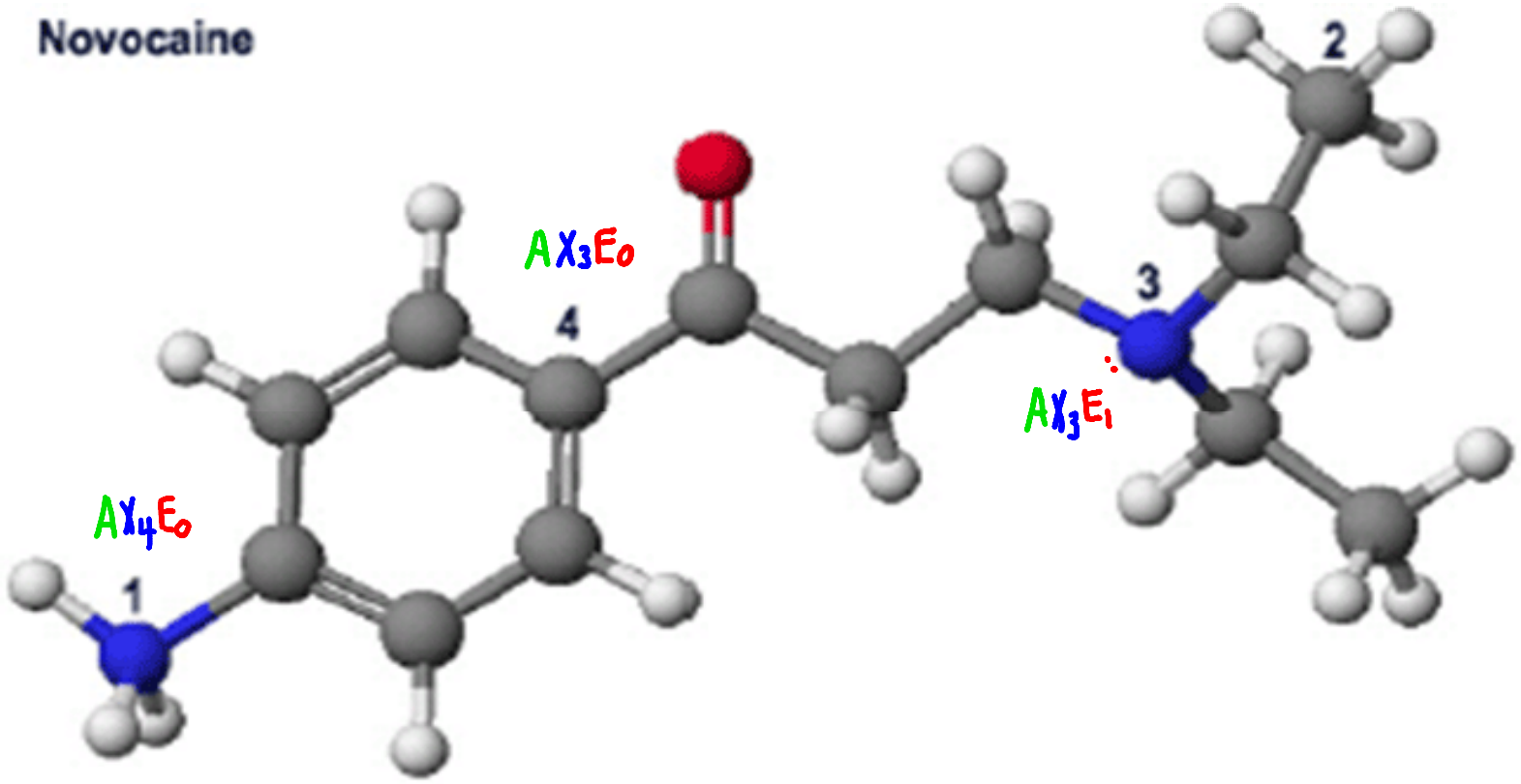
Bond Angles in Organic Molecules



C-1: ≈109° C-2: 120° N-3: 120°

8.5 Valence-Shell Electron-Pair Repulsion and Molecular Shape

Bond Angles in Organic Molecules



N-1: ~109° **N-3:** ~109° **C-4:** 120°

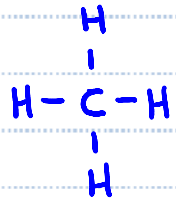
8.5 Valence-Shell Electron-Pair Repulsion and Molecular Shape

Bond Angles

Which of the following molecules has the smallest bond angle?

a) CH_4 b) NO_2^+ c) NH_3 d) H_2O

CH_4:



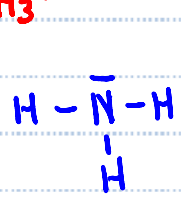
AX_4E_0

TETRAHEDRON

TETRAHEDRON

~109°

NH_3:



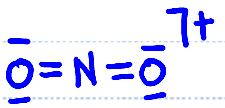
AX_3E_1

TETRAHEDRON

TRIGONAL PYRAMID

~109°

NO_2^+:



AX_2E_0

LINEAR

LINEAR

180°

H_2O:

AX_2E_2

TETRAHEDRON

ANGULAR / BENT

~109°

H_2O! ... lone pair electrons have a larger spacial requirement, the more lone pairs the smaller the bond angle.