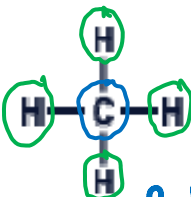
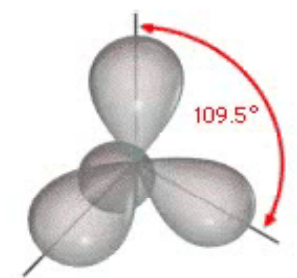
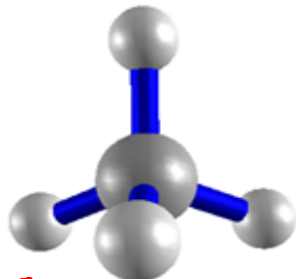
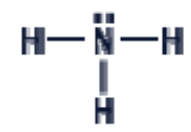
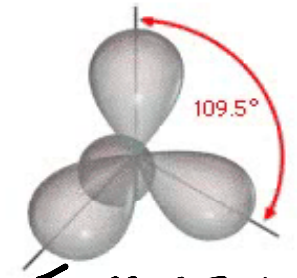
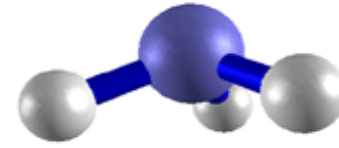

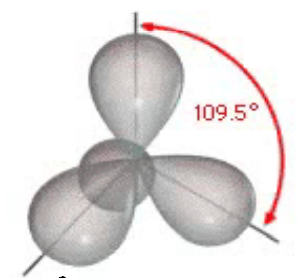
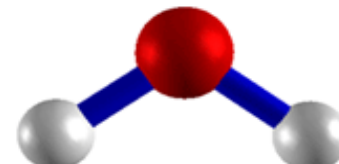


Announcements – Lecture XI – Thursday, Oct 18^h


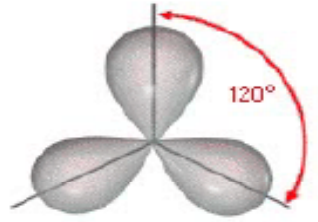
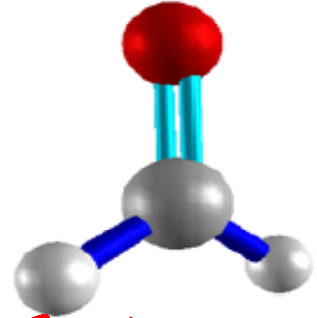
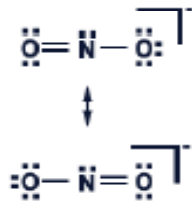
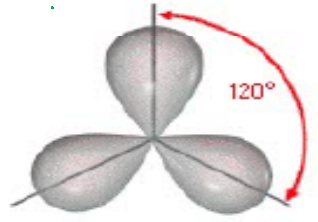
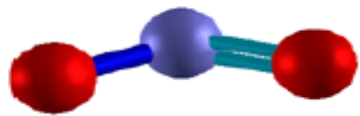
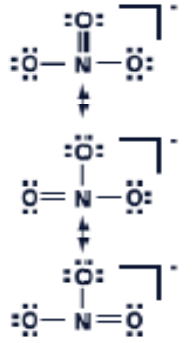
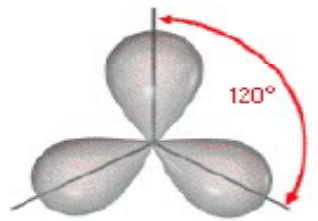
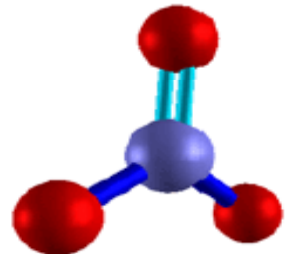


3.10 Molecular Geometries and Bond Angles → ELECTRON PAIR GEOMETRY

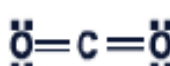
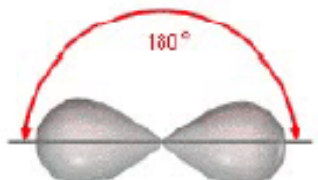
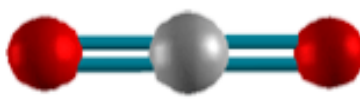
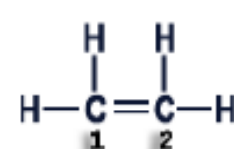
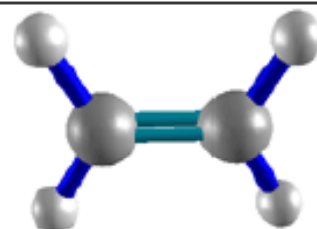
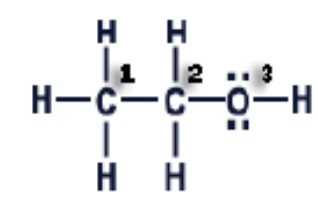
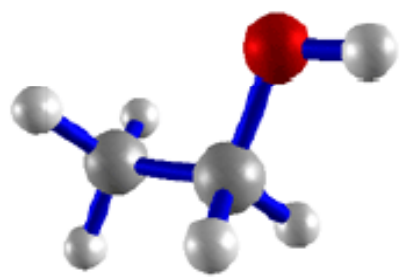
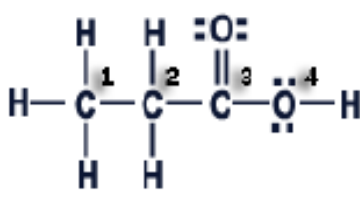
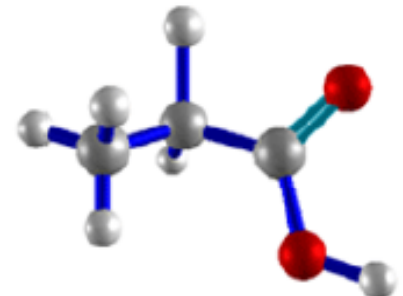
Molecular Geometry Worksheet Fall 2008 ... Whelan ... Page 1

Lewis Structure	Classification	X+E	Parent Geometry	Molecular Geometry	Bond Angle	Polarity
<p>CH₄</p>  <p>A: Central atom X: Attachments on A E: Lone pairs on A</p>	<u>AX₄E₀</u>	<u>4</u>	 <p>TETRAHEDRON</p>	 <p>TETRAHEDRON</p>	<u>~109°</u>	
<p>NH₃</p> 	<u>AX₃E₁</u>	<u>4</u>	 <p>TETRAHEDRON</p>	 <p>TRIGONAL PYRAMID</p>	<u>~109°</u>	
<p>H₂O</p> 	<u>AX₂E₂</u>	<u>4</u>	 <p>TETRAHEDRON</p>	 <p>ANGULAR/BENT 109°</p>	<u>~109°</u>	

3.10 Molecular Geometries and Bond Angles

Lewis Structure	Classification	X+E	Parent Geometry	Molecular Geometry	Bond Angle	Polarity
H_2CO 	<u>AX_3E_0</u>	<u>3</u>	 <u>TRIGONAL PLANAR</u>	 <u>TRIGONAL PLANAR</u>	<u>120°</u>	
NO_2^- 	<u>AX_2E_1</u>	<u>3</u>	 <u>TRIGONAL PLANAR</u>	 <u>ANGULAR/BENT 120°</u>	<u>120°</u>	
NO_3^- 	<u>AX_3E_0</u>	<u>3</u>	 <u>TRIGONAL PLANAR</u>	 <u>TRIGONAL PLANAR</u>	<u>120°</u>	

3.10 Molecular Geometries and Bond Angles

Lewis Structure	Classification	X+E	Parent Geometry	Molecular Geometry	Bond Angle	Polarity
CO_2 	<u>AX₂E₀</u>	<u>2</u>	 <u>LINEAR</u>	 <u>LINEAR</u>	<u>180°</u>	
C_2H_4 	1: <u>AX₂E₀</u> 2: <u>AX₂E₀</u>	<u>3</u> <u>3</u>	1: <u>TRIGONAL PLANAR</u> 2: <u>TRIGONAL PLANAR</u>		1: <u>120°</u> 2: <u>120°</u>	
C_2H_5OH 	1: <u>AX₄E₀</u> 2: <u>AX₄E₀</u> 3: <u>AX₂E₂</u>	<u>4</u> <u>4</u> <u>4</u>	1: <u>TETRAHEDRON</u> 2: <u>TETRAHEDRON</u> 3: <u>TETRAHEDRON</u>		1: <u>~109°</u> 2: <u>~109°</u> 3: <u>~109°</u>	
C_2H_5COOH 	1: <u>AX₄E₀</u> 2: <u>AX₄E₀</u> 3: <u>AX₃E₀</u> 4: <u>AX₂E₂</u>	<u>4</u> <u>4</u> <u>3</u> <u>4</u>	1: <u>TETRAHEDRON</u> 2: <u>TETRAHEDRON</u> 3: <u>TRIGONAL PLANAR</u> 4: <u>TETRAHEDRON</u>		1: <u>~109°</u> 2: <u>~109°</u> 3: <u>120°</u> 4: <u>~109°</u>	

3.10 Molecular Geometries and Bond Angles Summary

	ELECTRON PAIR GEOMETRY		MOLECULAR GEOMETRY
$X+E = 4$	TETRAHEDRON ($\sim 109^\circ$)	$E=0$	TETRAHEDRON
		$E=1$	TRIGONAL PYRAMID
		$E=2$	ANGULAR/BENT $\sim 109^\circ$
$X+E = 3$	TRIGONAL PLANAR (120°)	$E=0$	TRIGONAL PLANAR
		$E=1$	ANGULAR/BENT 120°
$X+E = 2$	LINEAR (180°)	$E=0$	LINEAR

3.10 Molecular Geometries and Bond Angles Morphine

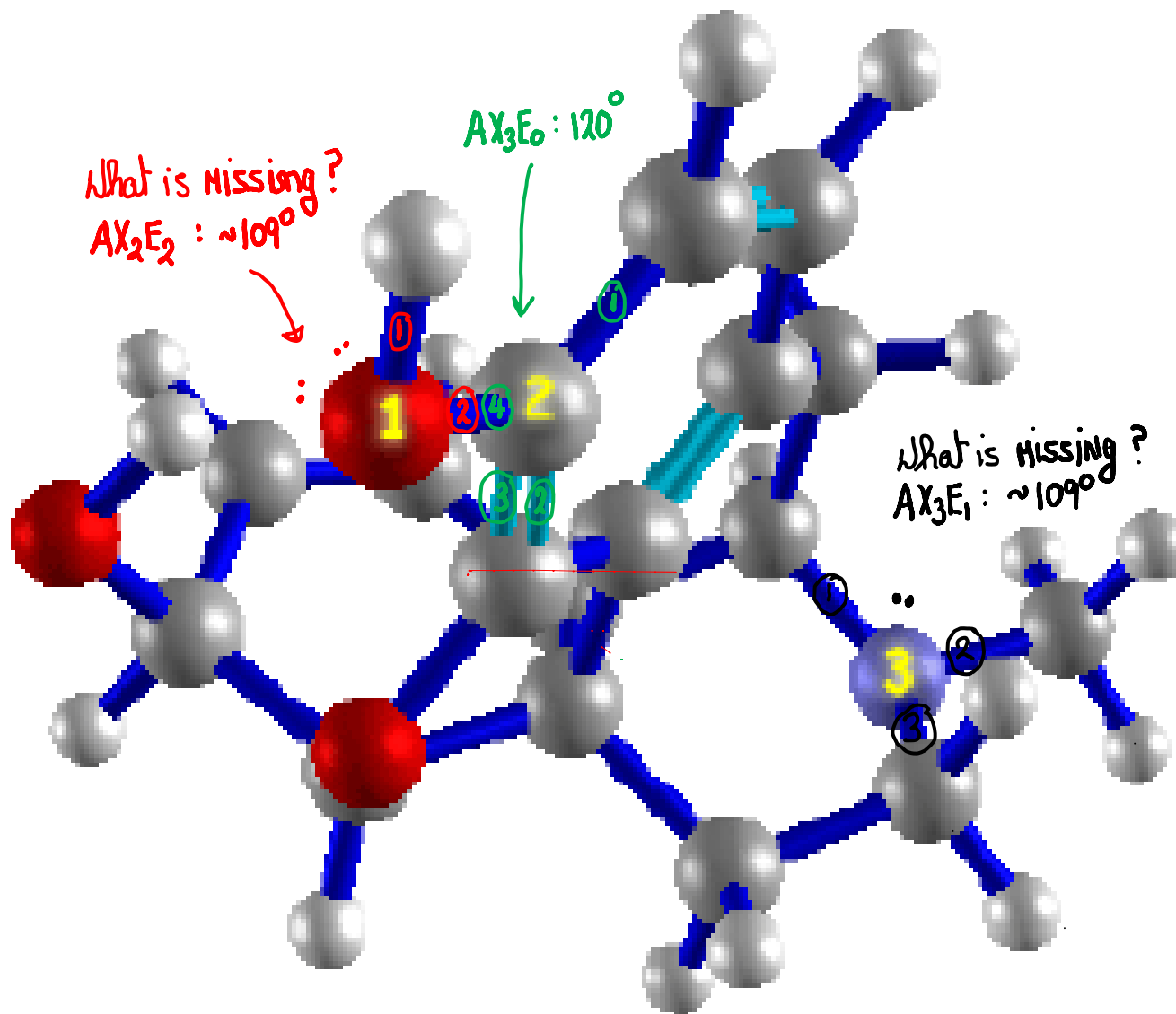
Color code:

Red: O

Blue: N

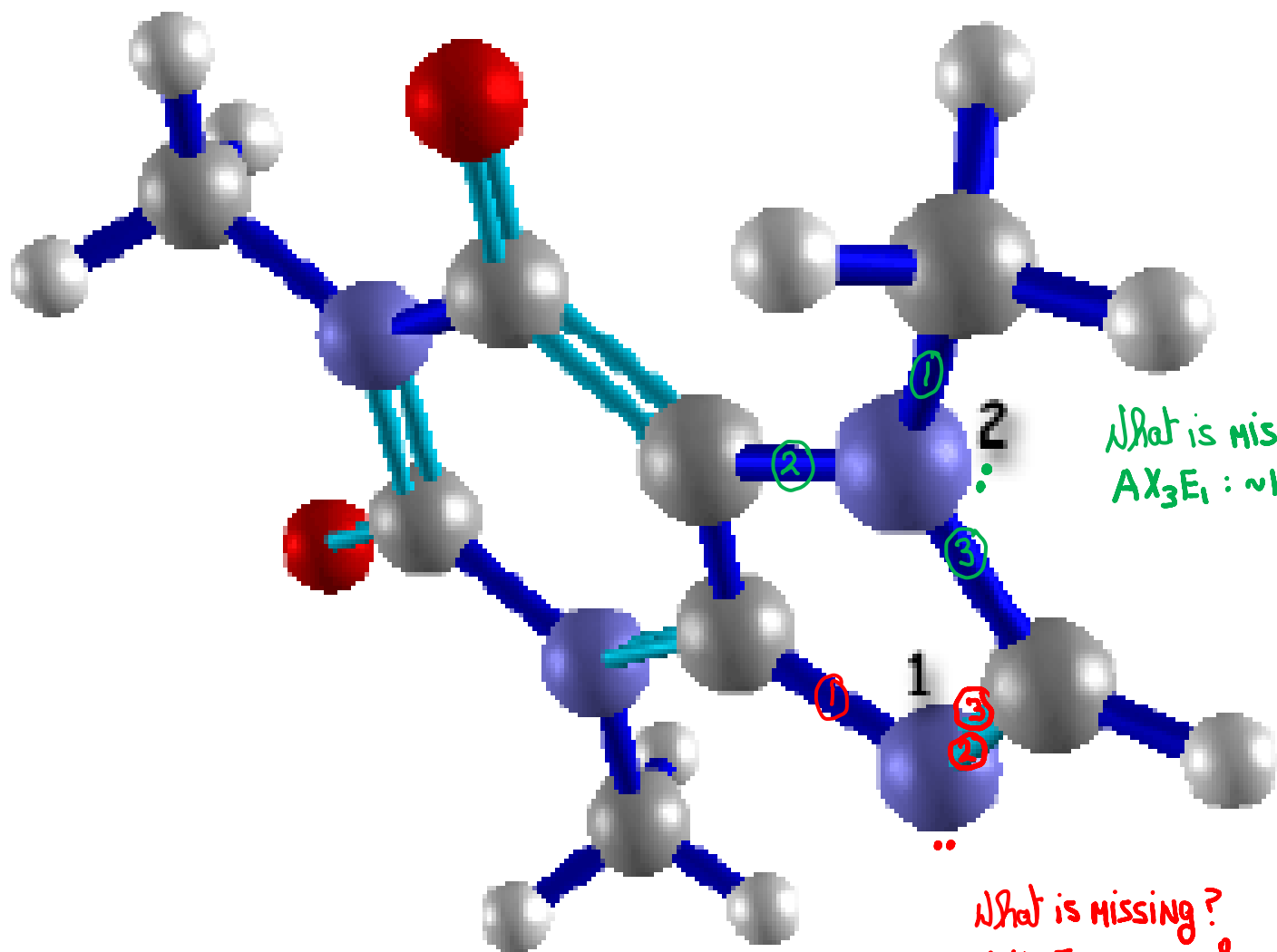
Gray: C

White: H



3.10 Molecular Geometries and Bond Angles

Caffeine

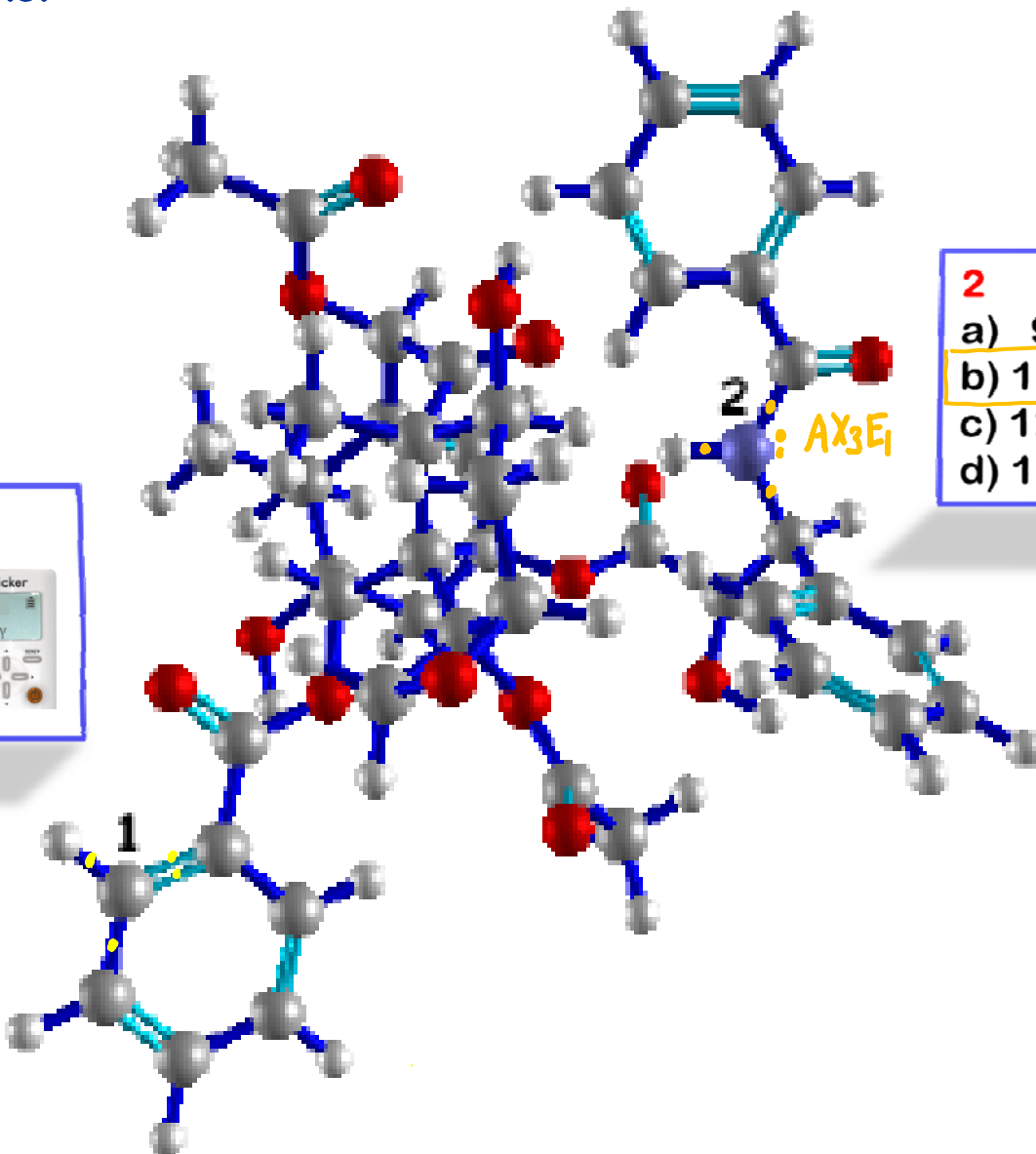



3.10 Molecular Geometries and Bond Angles

Taxol


1

- a) 90
- b) 109
- c) 120**
- d) 180



2

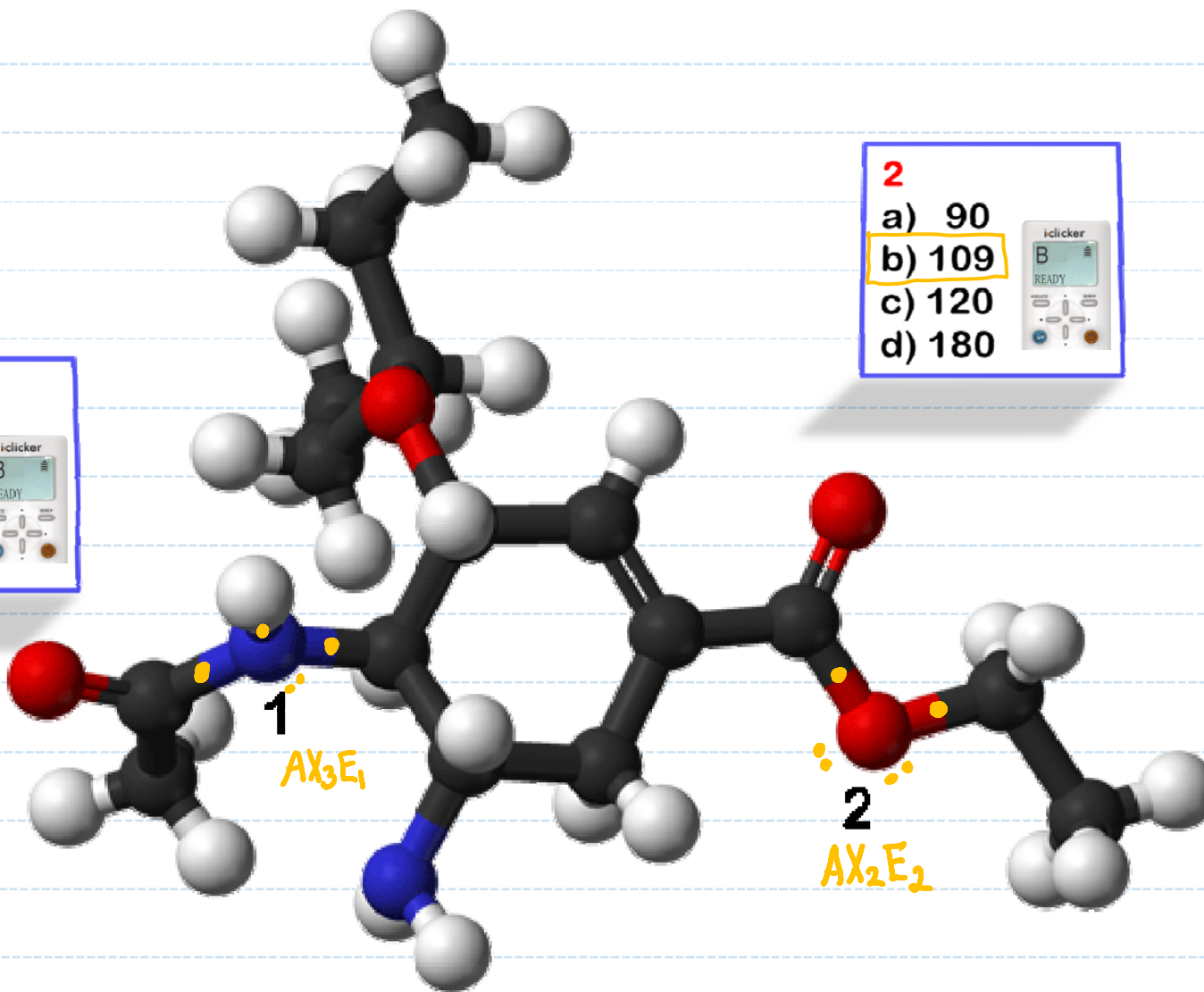
- a) 90
- b) 109**
- c) 120
- d) 180



3.10 Molecular Geometries and Bond Angles Tamiflu

1

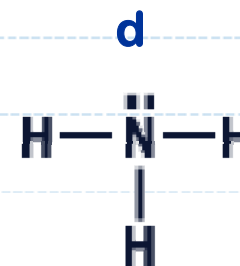
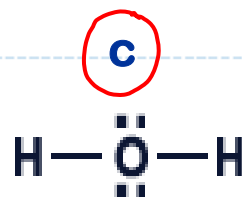
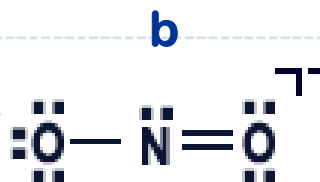
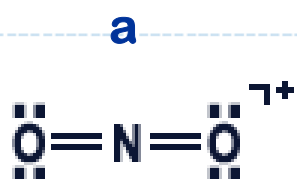
- a) 90
- b) 109**
- c) 120
- d) 180



2

- a) 90
- b) 109**
- c) 120
- d) 180

3.10 Molecular Geometries and Bond Angles



Which of the above molecules has the smallest bond angle?

AX_2
Linear
 180°

AX_2E_1
TRIGONAL planar
 120°

AX_2E_2
Tetrahedron
 $\sim 109^\circ$
2 lone pairs

AX_3E_1
Tetrahedron
 $\sim 109^\circ$
1 lone pair