

Announcements – Lecture XIV – Thursday, Oct 27th

1.

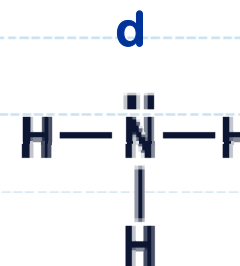
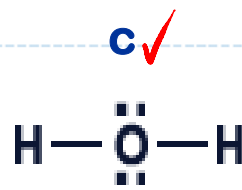
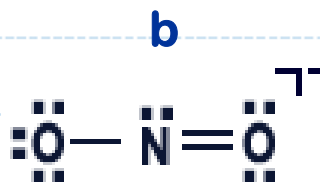
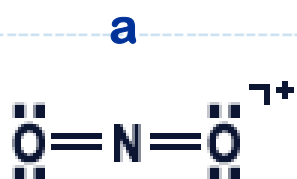


iClicker:

Choose any letter: A-E



3.10 Molecular Geometries and Bond Angles



Which of the above molecules has the smallest bond angle?

AX_2E_0

Linear

180°

AX_2E_1

Trigonal planar

120°

AX_2E_2

Tetrahedron

$\sim 109^\circ$

2 lone pairs

AX_3E_1

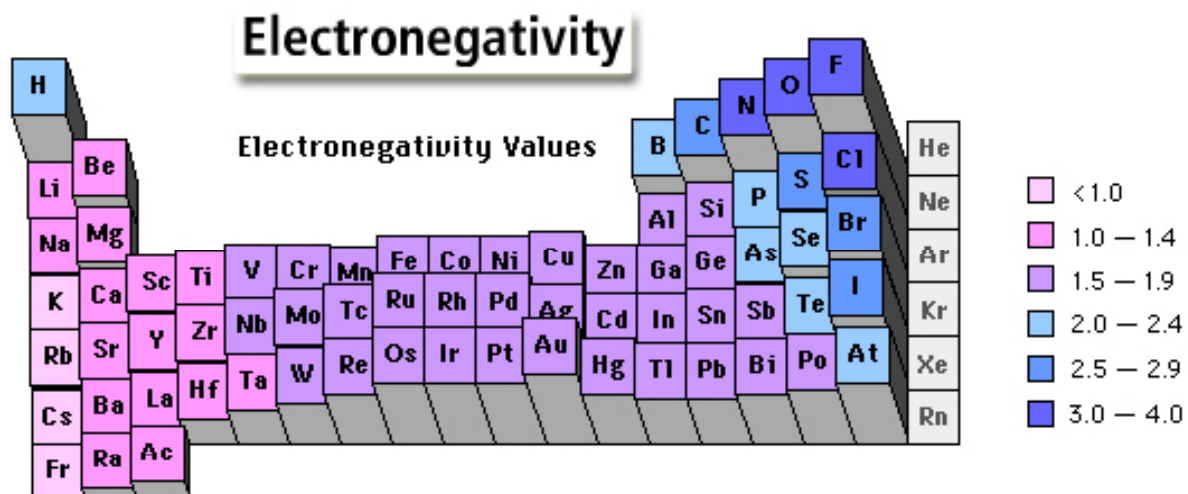
Tetrahedron

$\sim 109^\circ$

1 lone pair



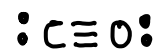
3.11 How Do We Determine if a Molecule is Polar



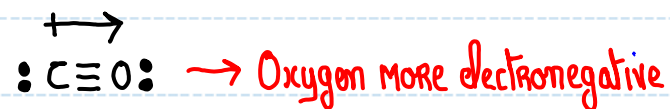
? Polar bond ... difference in electronegative



↳ Non polar bond.



↳ Polar bond



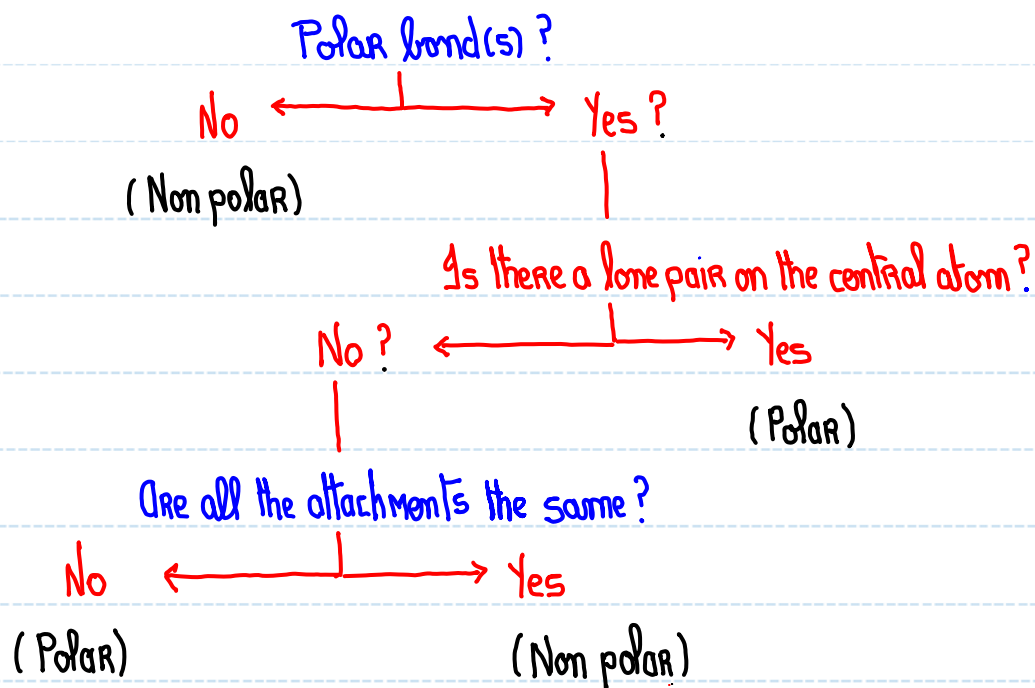
Polar molecule



3.11 How Do We Determine if a Molecule is Polar

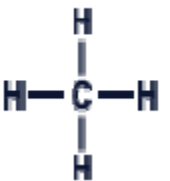
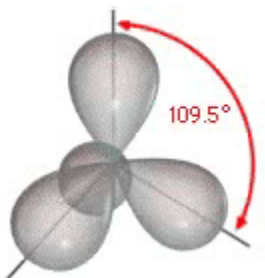
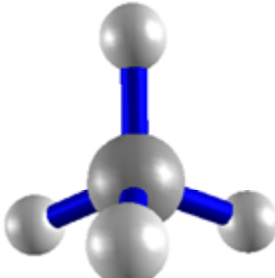
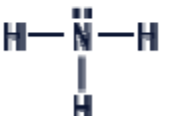
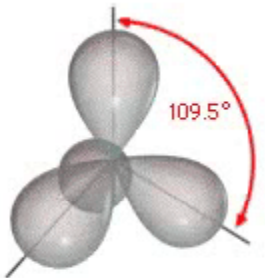
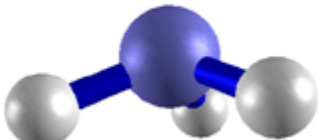

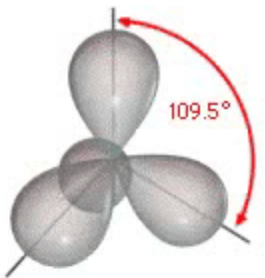
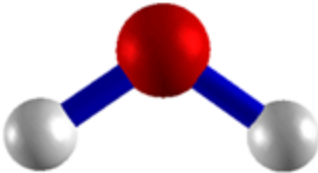
If the vector sum of the polar bonds is $\neq 0$ then the molecule is polar.

The following series of questions work to determine molecular polarity for simple molecules whose $X+E = 2, 3, \text{ or } 4$.



3.11 How Do We Determine if a Molecule is Polar

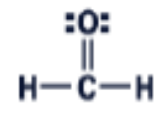
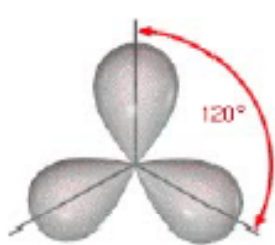
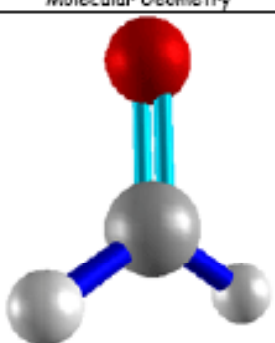
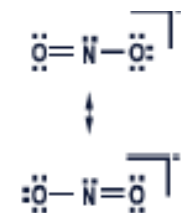
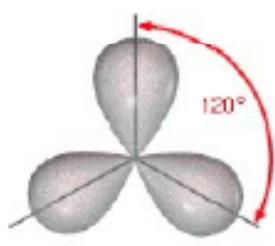
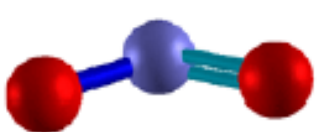

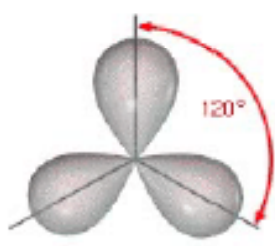
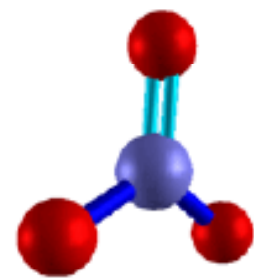
Molecular Geometry Worksheet ... Fall 2008 ... Whelan ... Page 1

Lewis Structure	Classification	X+E	Parent Geometry	Molecular Geometry	Bond Angle	Polarity
CH_4 	AX_4E_0	4	 Tetrahedron	 Tetrahedron	$\sim 109^\circ$	<u>NP</u>
NH_3 	AX_3E_1	4	 Tetrahedron	 Trigonal pyramid	$\sim 109^\circ$	<u>P</u>
H_2O 	AX_2E_2	4	 Tetrahedron	 Bent/Angular (109°)	$\sim 109^\circ$	<u>P</u>



3.11 How Do We Determine if a Molecule is Polar

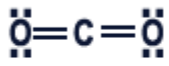
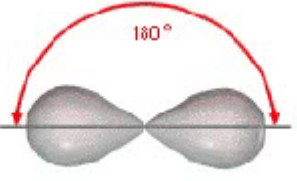

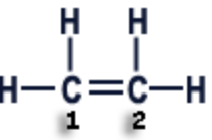
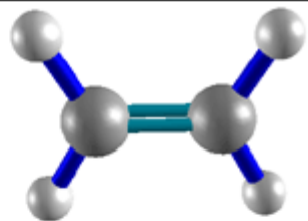
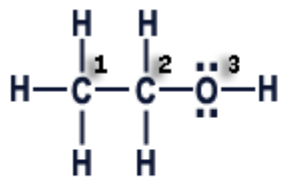
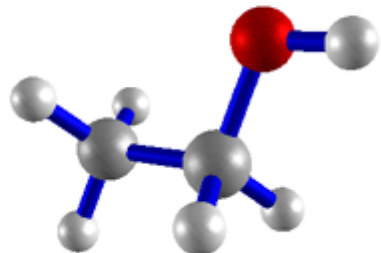
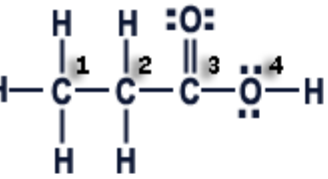
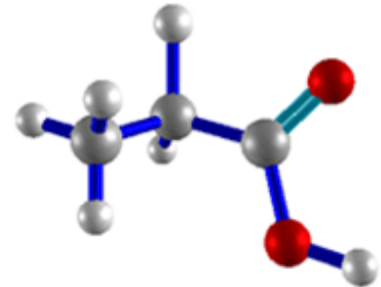
Molecular Geometry Worksheet ... Fall 2008 ... Whelan ... Page 2

Lewis Structure	Classification	X+E	Parent Geometry	Molecular Geometry	Bond Angle	Polarity
H_2CO 	AX_3E_0	3	 Trigonal planar	 Trigonal planar	120°	<u>P</u>
NO_2^- 	AX_2E_1	3	 Trigonal planar	 Bent/Angular (120°)	120°	<u>P</u>
NO_3^- 	AX_3E_0	3	 Trigonal planar	 Trigonal planar	120°	<u>NP</u>



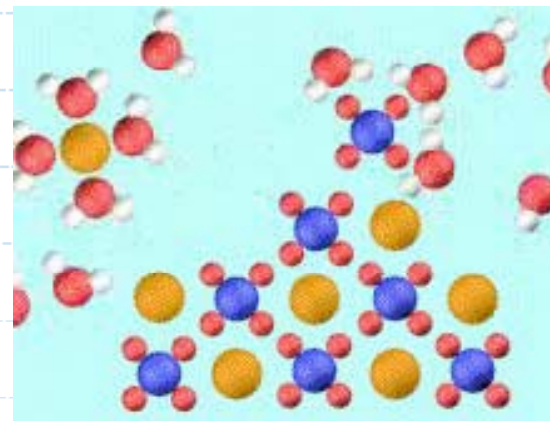
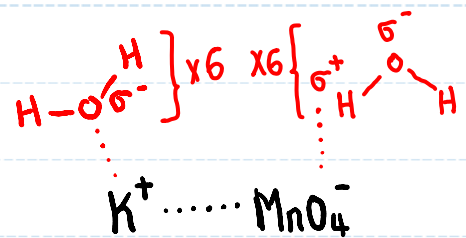
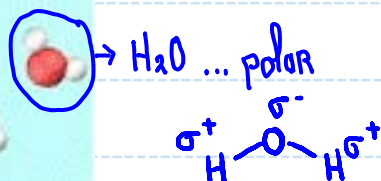
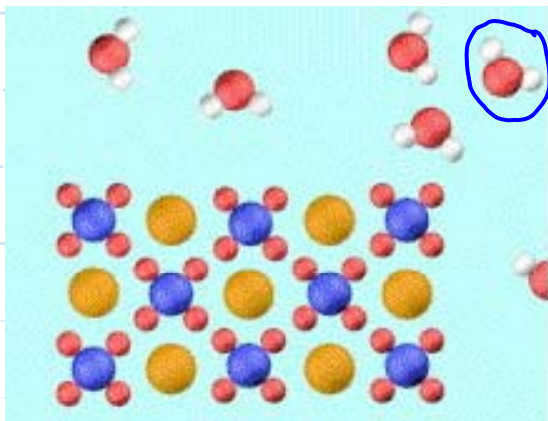
3.11 How Do We Determine if a Molecule is Polar

Molecular Geometry Worksheet ... Fall 2008 ... Whelan ... Page 3

Lewis Structure	Classification	X+E	Parent Geometry	Molecular Geometry	Bond Angle	Polarity
CO_2 	AX_2	2	 Linear	 Linear	180°	NP
C_2H_4 	1: AX_3E_0 2: AX_3E_0	3 3	1: Trigonal planar 2: Trigonal planar		1: 120° 2: 120°	
C_2H_5OH 	1: AX_4E_0 2: AX_4E_0 3: AX_2E_2	4 4 4	1: Tetrahedron 2: Tetrahedron 3: Tetrahedron		1: $\sim 109^\circ$ 2: $\sim 109^\circ$ 3: $\sim 109^\circ$	
C_2H_5COOH 	1: AX_4E_0 2: AX_4E_0 3: AX_3E_0 4: AX_2E_2	4 4 3 4	1: Tetrahedron 2: Tetrahedron 3: Trigonal planar 4: Tetrahedron		1: $\sim 109^\circ$ 2: $\sim 109^\circ$ 3: 120° 4: $\sim 109^\circ$	

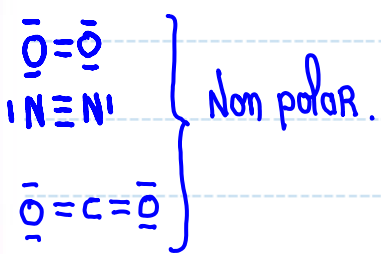


3.11 Consequence of Molecular Polarity



Solubility of Some Common Substances		
Compound	Solubility in H_2O g/100mL	
NaCl	35.7	0°C
O ₂	4.5x10 ⁻³	18°C
N ₂	2.0x10 ⁻³	18°C
NH ₃	89.5	0°C
CO ₂	0.179	18°C
HCl	72.1	20°C

H_2O → Polar



Oil, non polar

H_2O , polar

"like dissolves like"

3.11 Consequence of Molecular Polarity

Salad dressings ... Lead poisoning ... Chelating therapy

EDTA: Ethylenediaminetetraacetic acid.

See class web site ... Lead Poisoning

