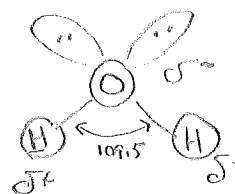
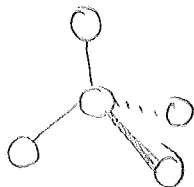
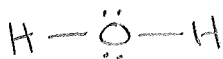


1. Draw the Lewis structure for water, H<sub>2</sub>O.

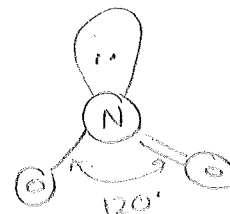
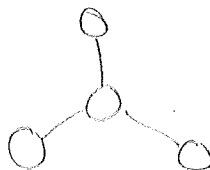
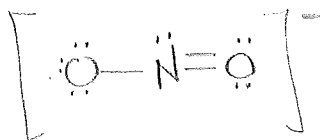


- How many "groups" (atoms and lone pairs) surround the central oxygen?  
4
- What is the **geometry** of this molecule (look at atoms and lone pairs)? Draw this VSEPR structure next to the Lewis structure.  
Tetrahedral
- What is the **shape** of this molecule (look only at the atoms)?  
Bent
- What is the H-O-H bond angle?  
 $\angle 109.5^\circ$
- Place the partial positive and negative charges on the H and O atoms, based on their relative electronegativities. Is water a **polar** compound?

Yes

2. Draw the Lewis structure for NO<sub>2</sub><sup>-</sup>.

$$\begin{array}{r} \text{N} \quad 5 \\ \text{O} \quad 2 \times 6 \\ \hline \quad \quad 1 \\ \hline 18e^- \end{array}$$



- How many "groups" (atoms and lone pairs) surround the central nitrogen?  
3
- What is the **geometry** of this molecule (look at atoms and lone pairs)? Draw this VSEPR structure next to the Lewis structure.  
Trigonal Planar
- What is the **shape** of this molecule (look only at the atoms)?  
Bent
- What is the O-N-O bond angle?  
 $\angle 120.5^\circ$
- Place the partial positive and negative charges on the N and O atoms, based on their relative electronegativities. Is NO<sub>2</sub><sup>-</sup> a **polar** compound?

Yes

3. Draw the Lewis and VSEPR structures for the following 12 compounds and label them with their geometry.

Lewis

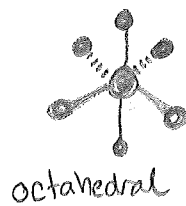
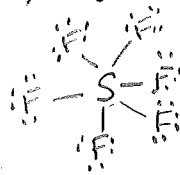
VSEPR

Lewis

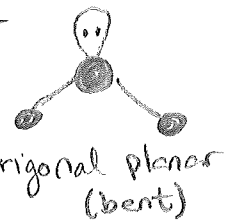
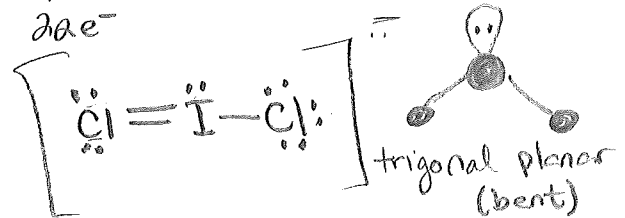
VSEPR

a) SF<sub>6</sub>

$$\begin{array}{r} S: 6 \\ F: 6 \times 7 \\ \hline 48e^- \end{array}$$

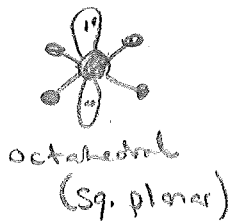
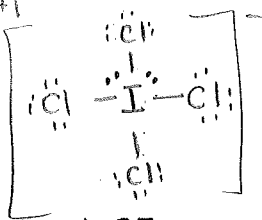


b) ICl<sub>2</sub><sup>-</sup>  
2ae<sup>-</sup>



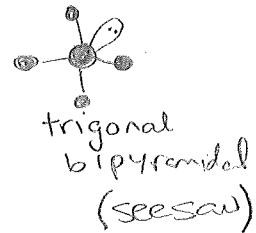
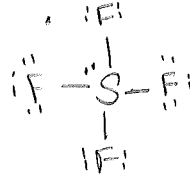
c) ICl<sub>4</sub><sup>-</sup>

$$7 + (4 \times 7) + 1 = 36e^-$$



d) SF<sub>4</sub>

$$6 + 4 \times 7 = 34e^-$$



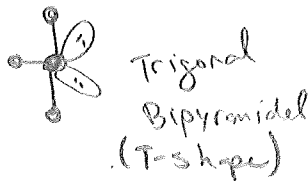
e) CF<sub>4</sub>

$$4 + 7 \times 4 = 32$$



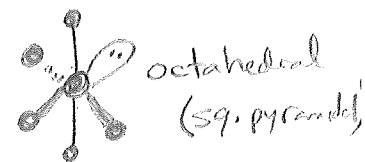
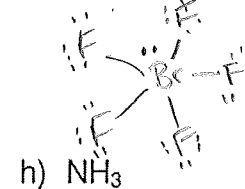
g) BrF<sub>3</sub>

$$7 + 3 \times 7 = 28e^-$$



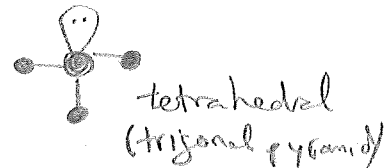
f) BrF<sub>5</sub>

$$7 + 7 \times 5 = 42$$



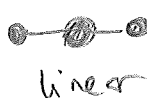
h) NH<sub>3</sub>

$$5 + 3 = 8$$



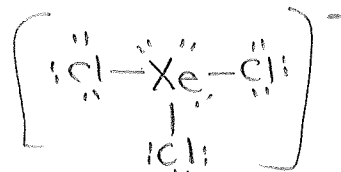
i) CO<sub>2</sub>

$$4 + 2 \times 6 = 16e^-$$



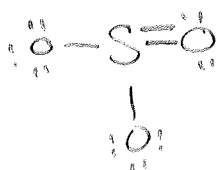
k) XeCl<sub>3</sub><sup>-</sup>

$$8 + 3 \times 7 + 1 = 30e^-$$



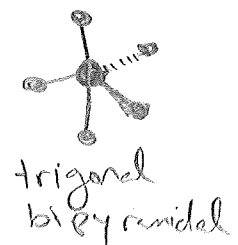
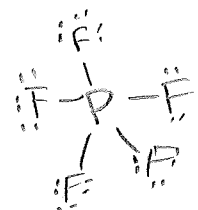
l) SO<sub>3</sub>

$$6 + 3 \times 6 = 24e^-$$



m) PF<sub>5</sub>

$$5 + 5 \times 7 = 40e^-$$



Now fill in the missing information in the chart using the structures you have drawn in problems 1 - 3.

compound	atoms on central atom	lone pairs on central atom	geometry	shape	polar
SF <sub>6</sub>	6	0	octahedral	octahedral	N
BrF <sub>5</sub>	5	1	octahedral	sq. pyramidal	Y
ICl <sub>4</sub> <sup>-</sup>	4	2	octahedral	sq. planar	N
XeCl <sub>3</sub> <sup>-</sup>	3	2	Trigonal Bipyramidal	T-shape	Y
PF <sub>5</sub>	5	0	Trigonal Bipyramidal	Trig. Bipyramidal	N
SF <sub>4</sub>	4	1	Trigonal Bipyramidal	seesaw	Y
BrF <sub>3</sub>	3	2	Trigonal Bipyramidal	T-shape	Y
CO <sub>2</sub>	2	0	trigonal bipyramidal	linear	N
CF <sub>4</sub>	4	0	Tetrahedral	Tetrahedral	N
NH <sub>3</sub>	3	1	Tetrahedral	Trigonal pyramidal	Y
H <sub>2</sub> O	2	2	tetrahedral	V-shaped (bent)	yes
SO <sub>3</sub>	3	0	trigonal planar	trigonal planar	no
NO <sub>2</sub> <sup>-</sup>	2	1	trigonal planar	bent	Y
CO <sub>2</sub>	2	0	linear	linear	N

## Polarity Worksheet

*For each of the following pairs of molecules, determine which is most polar and explain your reason for making this choice:*

- 1) carbon disulfide                      OR                      sulfur difluoride
  
- 2) water                                      OR                      oxygen dichloride
  
- 3) boron trihydride                      OR                      ammonia
  
- 4) phosphorus tribromide              OR                      phosphorus trichloride
  
- 5) silicon dioxide                        OR                      carbon dioxide
  
- 6) methane                                 OR                      CH<sub>2</sub>Cl<sub>2</sub>
  
- 7) silicon tetrabromide                 OR                      HCN
  
- 8) nitrogen trifluoride                 OR                      phosphorus trifluoride