

# Bonding & Molecular Structure - LEWIS STRUCTURES

PSI Chemistry

Name \_\_\_\_\_

Indicate the number of valence electrons, draw the Lewis electron dot structure, and write the VSEPR number (if appropriate) for each of the species listed.

<b>F</b> Valence Electrons _____  VSEPR #: n/a	<b>O</b> Valence Electrons _____  VSEPR #: n/a	<b>K</b> Valence Electrons _____  VSEPR #: n/a	<b>Al</b> Valence Electrons _____  VSEPR #: n/a
<b>F<sup>-</sup></b> Valence Electrons _____  VSEPR #: n/a	<b>O<sup>2-</sup></b> Valence Electrons _____  VSEPR #: n/a	<b>K<sup>+</sup></b> Valence Electrons _____  VSEPR #: n/a	<b>Al<sup>3+</sup></b> Valence Electrons _____  VSEPR #: n/a
<b>HF</b> Valence Electrons _____  VSEPR # _____	<b>NH<sub>3</sub></b> Valence Electrons _____  VSEPR # _____	<b>CH<sub>4</sub></b> Valence Electrons _____  VSEPR # _____	<b>NF<sub>3</sub></b> Valence Electrons _____  VSEPR # _____
<b>SiF<sub>4</sub></b> Valence Electrons _____  VSEPR # _____	<b>F<sub>2</sub></b> Valence Electrons _____  VSEPR # _____	<b>O<sub>2</sub></b> Valence Electrons _____  VSEPR # _____	<b>N<sub>2</sub></b> Valence Electrons _____  VSEPR # _____

<p style="text-align: center;"><b>C<sub>2</sub>H<sub>6</sub></b></p> <p>Valence Electrons _____</p> <p>VSEPR # _____</p>	<p style="text-align: center;"><b>C<sub>2</sub>H<sub>2</sub></b></p> <p>Valence Electrons _____</p> <p>VSEPR # _____</p>	<p style="text-align: center;"><b>C<sub>2</sub>H<sub>4</sub></b></p> <p>Valence Electrons _____</p> <p>VSEPR # _____</p>	<p style="text-align: center;"><b>C<sub>2</sub>F<sub>4</sub></b></p> <p>Valence Electrons _____</p> <p>VSEPR # _____</p>
<p style="text-align: center;"><b>HCN</b></p> <p>Valence Electrons _____</p> <p>VSEPR # _____</p>	<p style="text-align: center;"><b>CO</b></p> <p>Valence Electrons _____</p> <p>VSEPR # _____</p>	<p style="text-align: center;"><b>CO<sub>2</sub></b></p> <p>Valence Electrons _____</p> <p>VSEPR # _____</p>	<p style="text-align: center;"><b>CN<sup>-</sup></b></p> <p>Valence Electrons _____</p> <p>VSEPR # _____</p>
<p style="text-align: center;"><b>SO<sub>4</sub><sup>2-</sup></b></p> <p>Valence Electrons _____</p> <p>VSEPR # _____</p>	<p style="text-align: center;"><b>PO<sub>4</sub><sup>3-</sup></b></p> <p>Valence Electrons _____</p> <p>VSEPR # _____</p>	<p style="text-align: center;"><b>ClO<sub>3</sub><sup>-</sup></b></p> <p>Valence Electrons _____</p> <p>VSEPR # _____</p>	<p style="text-align: center;"><b>CO<sub>3</sub><sup>2-</sup></b></p> <p>Valence Electrons _____</p> <p>VSEPR # _____</p>
<p style="text-align: center;"><b>NO<sub>3</sub><sup>-</sup></b></p> <p>Valence Electrons _____</p> <p>VSEPR # _____</p>	<p style="text-align: center;"><b>SO<sub>2</sub></b></p> <p>Valence Electrons _____</p> <p>VSEPR # _____</p>	<p style="text-align: center;"><b>O<sub>3</sub></b></p> <p>Valence Electrons _____</p> <p>VSEPR # _____</p>	<p style="text-align: center;"><b>SF<sub>6</sub></b></p> <p>Valence Electrons _____</p> <p>VSEPR # _____</p>
<p style="text-align: center;"><b>XeF<sub>4</sub></b></p> <p>Valence Electrons _____</p> <p>VSEPR # _____</p>	<p style="text-align: center;"><b>PF<sub>5</sub></b></p> <p>Valence Electrons _____</p> <p>VSEPR # _____</p>	<p style="text-align: center;"><b>SeF<sub>4</sub></b></p> <p>Valence Electrons _____</p> <p>VSEPR # _____</p>	<p style="text-align: center;"><b>BH<sub>3</sub></b></p> <p>Valence Electrons _____</p> <p>VSEPR # _____</p>

Write the Name, Draw the Lewis Structure, Give the VSEPR number and EDG and MDG for the following:

SeCl <sub>2</sub>	Name:
Lewis Structure	VSEPR: EDG: MG:

ClF <sub>3</sub>	Name:
Lewis Structure	VSEPR: EDG: MG:

ICl <sub>4</sub> <sup>-</sup>	Name:
Lewis Structure	VSEPR: EDG: MG:

PBr <sub>3</sub>	Name:
Lewis Structure	VSEPR: EDG: MG:

H <sub>3</sub> O <sup>+</sup>	Name:
Lewis Structure	VSEPR: EDG: MG:

$\text{AsCl}_5$	Name:
Lewis Structure	VSEPR: EDG: MG:

$\text{BrF}_5$	Name:
Lewis Structure	VSEPR: EDG: MG:

$\text{XeF}_2$	Name:
Lewis Structure	VSEPR: EDG: MG:

$\text{ClO}_3^-$	Name:
Lewis Structure	VSEPR: EDG: MG:

$\text{TeF}_4$	Name:
Lewis Structure	VSEPR: EDG: MG: \

<p style="text-align: center;"><b>F</b></p> <p>Valence Electrons 7</p> <p style="text-align: center;"> <math>\begin{array}{c} \cdot\cdot \\ \cdot\text{F}\cdot \\ \cdot\cdot \end{array}</math> </p> <p>VSEPR #: n/a</p>	<p style="text-align: center;"><b>O</b></p> <p>Valence Electrons 6</p> <p style="text-align: center;"> <math>\begin{array}{c} \cdot\cdot \\ \cdot\text{O}\cdot \\ \cdot\cdot \end{array}</math> </p> <p>VSEPR #: n/a</p>	<p style="text-align: center;"><b>K</b></p> <p>Valence Electrons 1</p> <p style="text-align: center;"> <math>\begin{array}{c} \cdot \\ \text{K} \end{array}</math> </p> <p>VSEPR #: n/a</p>	<p style="text-align: center;"><b>Al</b></p> <p>Valence Electrons 3</p> <p style="text-align: center;"> <math>\begin{array}{c} \cdot \\ \text{Al}\cdot \\ \cdot \end{array}</math> </p> <p>VSEPR #: n/a</p>
<p style="text-align: center;"><b>F<sup>-</sup></b></p> <p>Valence Electrons 8</p> <p style="text-align: center;"> <math>\begin{array}{c} \cdot\cdot \\ \cdot\text{F}\cdot \\ \cdot\cdot \end{array}</math> </p> <p>VSEPR #: n/a</p>	<p style="text-align: center;"><b>O<sup>2-</sup></b></p> <p>Valence Electrons 8</p> <p style="text-align: center;"> <math>\begin{array}{c} \cdot\cdot \\ \cdot\text{O}\cdot \\ \cdot\cdot \end{array}</math> </p> <p>VSEPR #: n/a</p>	<p style="text-align: center;"><b>K<sup>+</sup></b></p> <p>Valence Electrons 8</p> <p style="text-align: center;"> <math>\begin{array}{c} \cdot\cdot \\ \cdot\text{K}\cdot \\ \cdot\cdot \end{array}</math> </p> <p>VSEPR #: n/a</p>	<p style="text-align: center;"><b>Al<sup>3+</sup></b></p> <p>Valence Electrons 8</p> <p style="text-align: center;"> <math>\begin{array}{c} \cdot\cdot \\ \cdot\text{Al}\cdot \\ \cdot\cdot \end{array}</math> </p> <p>VSEPR #: n/a</p>
<p style="text-align: center;"><b>HF</b></p> <p>Valence Electrons 8</p> <p style="text-align: center;"> <math>\text{H}-\begin{array}{c} \cdot\cdot \\ \cdot\text{F}\cdot \\ \cdot\cdot \end{array}</math> </p> <p>VSEPR #: n/a</p>	<p style="text-align: center;"><b>NH<sub>3</sub></b></p> <p>Valence Electrons 8</p> <p style="text-align: center;"> <math>\begin{array}{c} \cdot\cdot \\ \text{H}-\text{N}-\text{H} \\   \\ \text{H} \end{array}</math> </p> <p>VSEPR #: 431</p>	<p style="text-align: center;"><b>CH<sub>4</sub></b></p> <p>Valence Electrons 8</p> <p style="text-align: center;"> <math>\begin{array}{c} \text{H} \\   \\ \text{H}-\text{C}-\text{H} \\   \\ \text{H} \end{array}</math> </p> <p>VSEPR #: 440</p>	<p style="text-align: center;"><b>NF<sub>3</sub></b></p> <p>Valence Electrons 26</p> <p style="text-align: center;"> <math>\begin{array}{c} \cdot\cdot \\ \cdot\text{F}-\text{N}-\cdot\cdot \\   \\ \cdot\cdot \\ \cdot\text{F}\cdot \\ \cdot\cdot \end{array}</math> </p> <p>VSEPR #: 431</p>
<p style="text-align: center;"><b>SiF<sub>4</sub></b></p> <p>Valence Electrons 32</p> <p style="text-align: center;"> <math>\begin{array}{c} \cdot\cdot \\ \cdot\text{F}\cdot \\   \\ \cdot\cdot \\ \cdot\text{F}\cdot-\text{Si}-\cdot\cdot \\   \\ \cdot\cdot \\ \cdot\text{F}\cdot \\ \cdot\cdot \end{array}</math> </p> <p>VSEPR #: 440</p>	<p style="text-align: center;"><b>F<sub>2</sub></b></p> <p>Valence Electrons 14</p> <p style="text-align: center;"> <math>\begin{array}{c} \cdot\cdot \\ \cdot\text{F}-\text{F}\cdot \\ \cdot\cdot \end{array}</math> </p> <p>VSEPR #: n/a</p>	<p style="text-align: center;"><b>O<sub>2</sub></b></p> <p>Valence Electrons 12</p> <p style="text-align: center;"> <math>\begin{array}{c} \cdot\cdot \\ \cdot\text{O}=\text{O}\cdot \\ \cdot\cdot \end{array}</math> </p> <p>VSEPR #: n/a</p>	<p style="text-align: center;"><b>N<sub>2</sub></b></p> <p>Valence Electrons 10</p> <p style="text-align: center;"> <math>\begin{array}{c} \cdot\cdot \\ \cdot\text{N}\equiv\text{N}\cdot \\ \cdot\cdot \end{array}</math> </p> <p>VSEPR #: n/a</p>

<p><b>C<sub>2</sub>H<sub>6</sub></b></p> <p>Valence Electrons 14</p> <pre>       H   H                 H-C-C-H                   H   H           </pre> <p>VSEPR #: 440 (each C)</p>	<p><b>C<sub>2</sub>H<sub>2</sub></b></p> <p>Valence Electrons 10</p> <p>H-C≡C-H</p> <p>VSEPR #: 220 (each C)</p>	<p><b>C<sub>2</sub>H<sub>4</sub></b></p> <p>Valence Electrons 12</p> <pre>       H   H        \ /         C=C        / \       H   H           </pre> <p>VSEPR #: 330</p>	<p><b>C<sub>2</sub>F<sub>4</sub></b></p> <p>Valence Electrons 36</p> <pre>       :F: :F:        \ /         C=C        / \       :F: :F:           </pre> <p>VSEPR # 330</p>
<p><b>HCN</b></p> <p>Valence Electrons 10</p> <p>H-C≡N:</p> <p>VSEPR #: 220</p>	<p><b>CO</b></p> <p>Valence Electrons 10</p> <p>:C≡O:</p> <p>VSEPR #: 211</p>	<p><b>CO<sub>2</sub></b></p> <p>Valence Electrons 16</p> <p>:O=C=O:</p> <p>VSEPR #: 220</p>	<p><b>CN<sup>-</sup></b></p> <p>Valence Electrons 10</p> <p>:C≡N:</p> <p>VSEPR #: 211</p>
<p><b>SO<sub>4</sub><sup>2-</sup></b></p> <p>Valence Electrons 32</p> <pre>       :O:             :O-S-O:               :O:           </pre> <p>VSEPR #: 440</p>	<p><b>PO<sub>4</sub><sup>3-</sup></b></p> <p>Valence Electrons 32</p> <pre>       :O:             :O-P-O:               :O:           </pre> <p>VSEPR #: 440</p>	<p><b>ClO<sub>3</sub><sup>-</sup></b></p> <p>Valence Electrons 26</p> <pre>       :O:             :O-Cl-O:           </pre> <p>VSEPR #: 431</p>	<p><b>CO<sub>3</sub><sup>2-</sup></b></p> <p>Valence Electrons 24</p> <pre>       :O:             :O=C-O:           </pre> <p>VSEPR #: 330 (Resonance)</p>
<p><b>NO<sub>3</sub><sup>-</sup></b></p> <p>Valence Electrons 24</p> <pre>       :O:             :O=N-O:           </pre> <p>VSEPR #: 330 (Resonance)</p>	<p><b>SO<sub>2</sub></b></p> <p>Valence Electrons 18</p> <pre>       :O:             :O-S=O:           </pre> <p>VSEPR #: 321 (Resonance)</p>	<p><b>O<sub>3</sub></b></p> <p>Valence Electrons 18</p> <pre>       :O:             :O-O=O:           </pre> <p>VSEPR #: 321 (Resonance)</p>	<p><b>SF<sub>6</sub></b></p> <p>Valence Electrons 48</p> <pre>       :F: :F:        \ /         S        / \       :F: :F:           </pre> <p>VSEPR #: 660</p>
<p><b>XeF<sub>4</sub></b></p> <p>Valence Electrons 36</p> <pre>       :F: :F:        \ /         Xe        / \       :F: :F:           </pre> <p>VSEPR #: 642</p>	<p><b>PF<sub>5</sub></b></p> <p>Valence Electrons 40</p> <pre>       :F: :F:        \ /         P        / \       :F: :F:           </pre> <p>VSEPR #: 550</p>	<p><b>SeF<sub>4</sub></b></p> <p>Valence Electrons 34</p> <pre>       :F:              :F-Se-F:                :F:           </pre> <p>VSEPR #: 541</p>	<p><b>BH<sub>3</sub></b></p> <p>Valence Electrons 6</p> <pre>       H             H-B-H           </pre> <p>VSEPR #: 330</p>

Write the Name, Draw the Lewis Structure, Give the VSEPR number and EDG and MDG for the following:

SeCl <sub>2</sub>	Name: Selenium Dichloride
Lewis Structure $\begin{array}{c} \text{:}\ddot{\text{Cl}}\text{:} - \ddot{\text{Se}} - \text{:}\ddot{\text{Cl}}\text{:} \\ \text{:}\ddot{\text{Cl}}\text{:} - \ddot{\text{Se}} - \text{:}\ddot{\text{Cl}}\text{:} \end{array}$	VSEPR: 4 2 2 EDG: Tetrahedral MG: Bent

ClF <sub>3</sub>	Name: Chlorine Trifluoride
Lewis Structure $\begin{array}{c} \text{:}\ddot{\text{F}}\text{:} - \ddot{\text{Cl}} - \text{:}\ddot{\text{F}}\text{:} \\   \\ \text{:}\ddot{\text{F}}\text{:} \end{array}$	VSEPR: 5 3 2 EDG: Trigonal Bipyramidal MG: T-Shape

ICl <sub>4</sub> <sup>-</sup>	Name: Tetrachloroiodate Ion
Lewis Structure $\left[ \begin{array}{c} \text{:}\ddot{\text{Cl}}\text{:} \\   \\ \text{:}\ddot{\text{Cl}}\text{:} - \ddot{\text{I}} - \text{:}\ddot{\text{Cl}}\text{:} \\   \\ \text{:}\ddot{\text{Cl}}\text{:} \end{array} \right]^{-}$	VSEPR: 6 4 2 EDG: Octahedral MG: Square Planar

PBr <sub>3</sub>	Name: Phosphorus Tribromide
Lewis Structure $\begin{array}{c} \text{:}\ddot{\text{Br}}\text{:} - \ddot{\text{P}} - \text{:}\ddot{\text{Br}}\text{:} \\   \\ \text{:}\ddot{\text{Br}}\text{:} \end{array}$	VSEPR: 4 3 1 EDG: Tetrahedral MG: Trigonal Pyramidal

H <sub>3</sub> O <sup>+</sup>	Name: Hydronium Ion
Lewis Structure $\left[ \begin{array}{c} \text{H} - \ddot{\text{O}} - \text{H} \\   \\ \text{H} \end{array} \right]^{+}$	VSEPR: 4 3 1 EDG: Tetrahedral MG: Trigonal Pyramidal

$\text{AsCl}_5$	Name: Arsenic Pentachloride
Lewis Structure 	VSEPR: 5 5 0 EDG: Trigonal Bipyramidal MG: Trigonal Bipyramidal

$\text{BrF}_5$	Name: Bromine Pentafluoride
Lewis Structure 	VSEPR: 6 5 1 EDG: Octahedral MG: Square Pyramidal

$\text{XeF}_2$	Name: Xenon Difluoride
Lewis Structure 	VSEPR: 5 2 3 EDG: Trigonal Bipyramidal MG: Linear

$\text{ClO}_3^-$	Name: Chlorate
Lewis Structure 	VSEPR: 4 3 1 EDG: Tetrahedral MG: Trigonal Pyramidal

$\text{TeF}_4$	Name: Tellurium Tetrafluoride
Lewis Structure 	VSEPR: 5 4 1 EDG: Trigonal Bipyramidal MG: See-Saw