

**Practice Questions on VSEPR**

- 1) Complete the table for each species listed. **Draw** the Lewis structures *by hand*. Include lone pairs of electrons where appropriate and try to respect the geometry.

| <b>Molecule</b>               | <b>Chemical Name</b> | <b>Lewis structure</b> | <b>Steric #</b> | <b>Electron geometry</b> | <b>Molecular geometry/Shape</b> |
|-------------------------------|----------------------|------------------------|-----------------|--------------------------|---------------------------------|
| H <sub>3</sub> O <sup>+</sup> |                      |                        |                 |                          |                                 |
| NH <sub>3</sub>               |                      |                        |                 |                          |                                 |
| AlCl <sub>3</sub>             |                      |                        |                 |                          |                                 |
| BrF <sub>5</sub>              |                      |                        |                 |                          |                                 |
| ClF <sub>3</sub>              |                      |                        |                 |                          |                                 |
| CH <sub>4</sub>               |                      |                        |                 |                          |                                 |

|                               |                   |  |  |  |  |
|-------------------------------|-------------------|--|--|--|--|
| SF <sub>4</sub>               |                   |  |  |  |  |
| PCl <sub>5</sub>              |                   |  |  |  |  |
| ICl <sub>4</sub> <sup>-</sup> |                   |  |  |  |  |
| XeOF <sub>4</sub>             | Xenon oxyfluoride |  |  |  |  |

- 2) Acetic acid (HCH<sub>3</sub>CO<sub>2</sub>) is the main organic constituent of vinegar. Draw a Lewis structure for acetic acid and give the bond angles *around each carbon atom*. HINT: The two carbons are connected by a single bond, and both oxygens are connected to the same carbon.
- 3) 3-dimensional on-line models of molecules.

**Instructions :**

- Go to this website: [https://phet.colorado.edu/sims/html/molecule-shapes/latest/molecule-shapes\\_en.html](https://phet.colorado.edu/sims/html/molecule-shapes/latest/molecule-shapes_en.html)
- Click on “Real Molecules.”
- At the top right corner of the screen, in the box called “Molecule,” click on this symbol ▼ to choose the molecule you want to create (see Figure 1 below).
- Choose from the following:
  - Options: Show lone pairs and/or bond angles.
  - Name: Molecular Geometry and/or Electron Geometry.
- Move the molecule around to see how it looks from different perspectives.

- Complete this activity for 5 molecules.

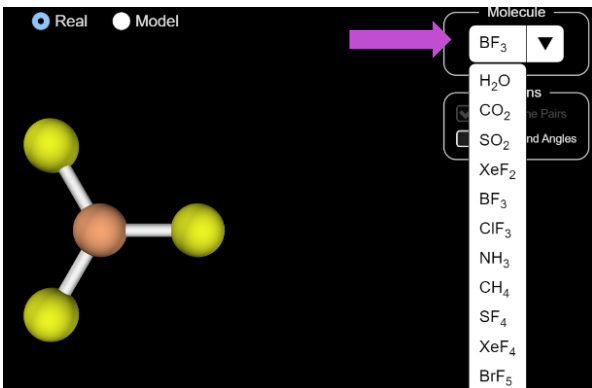


Figure 1: Choose the Molecule

The screenshot shows a software interface with a dark background. On the left, a 3D ball-and-stick model of a molecule is displayed. At the top left, there are two radio buttons labeled "Real" and "Model". To the right, a "Molecule" dropdown menu is open, showing a list of chemical formulas: BF<sub>3</sub>, H<sub>2</sub>O, CO<sub>2</sub>, SO<sub>2</sub>, XeF<sub>2</sub>, BF<sub>3</sub>, ClF<sub>3</sub>, NH<sub>3</sub>, CH<sub>4</sub>, SF<sub>4</sub>, XeF<sub>4</sub>, and BrF<sub>5</sub>. A pink arrow points to the dropdown menu.

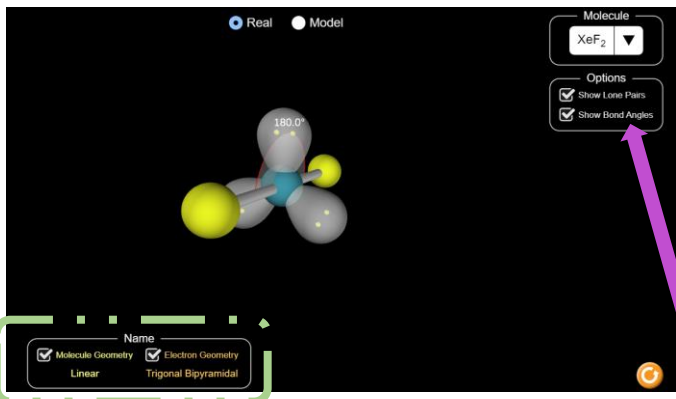


Figure 2: Choose the Name (Molecular or/and Electron Geometry) and Options (Show lone pairs and/or bond angles).

The screenshot shows the same software interface with a 3D ball-and-stick model of a molecule. At the top right, the "Molecule" dropdown menu is set to XeF<sub>2</sub>. Below it, an "Options" section contains two checked checkboxes: "Show Lone Pairs" and "Show Bond Angles". A pink arrow points to these options. At the bottom, a "Name" section is highlighted with a green dashed box, showing two checked checkboxes: "Molecular Geometry" and "Electron Geometry". Below these, the names "Linear" and "Trigonal Bipyramidal" are listed. A pink arrow also points to this section.