

Model Screen

In this screen students can build models of molecules by adding single, double, or triple bonded atoms or lone pairs of electrons to a central atom.

MOVE atoms or rotate the molecule to see the effect on molecule shape.

SHOW or hide molecule or electron geometry.

ADD or remove bonded atoms to see effect on shape.

ADD or remove lone electron pairs.

SHOW or hide lone electron pairs and bond angles.

Options: Show Lone Pairs, Show Bond Angles

Name: Molecule Geometry (Trigonal Pyramidal), Electron Geometry (Tetrahedral)

Real Molecules Screen

Compare the shape and bond angles in real molecules to the values predicted using VSEPR theory.

VIEW real molecule or VSEPR model

SELECT real molecule to view.

Molecule: SO₂

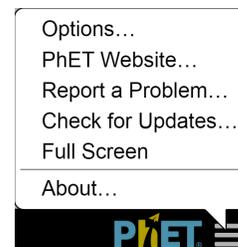
Options: Show Lone Pairs, Show Bond Angles

Name: Molecule Geometry (Bent), Electron Geometry (Trigonal Planar)

Real Molecules List: H₂O, CO₂, SO₂, XeF₂, BF₃, ClF₃, NH₃, CH₄, SF₄, XeF₄, BrF₅, PCl₅, SF₆

Complex Controls

- The play screen can be changed to a white background to facilitate projecting the simulation. To access this feature, select Options under the PhET tool bar menu.
- Lone pairs of electrons on the outer atoms can be shown in the Real Molecules screen. This feature can also be accessed under Options in the PhET tool bar menu.



Model Simplifications

- The Valence Shell Electron Pair Repulsion (VSEPR) model was used to determine molecule shape for a given number of electron domains.
- On the Model screen, bond angles displayed are those predicted by the basic geometry using the VSEPR model. This screen is meant to provide a basic understanding of electron and molecule geometry.
- While the sim stops you from adding more than six electron domains to the central atom, it is possible to have coordination numbers larger than six.
- Students can build non-physical structures in the Model screen. As the goals of the sim are to support students making sense of trends in molecule and electron geometry, the building of non-physical structures is allowed to the extent that the learning goals are supported.

Suggestions for Use

Sample Challenge Prompts

- There are cases where atoms are as far apart as possible but the angles between atoms are not the same. What shapes are these, and why might this happen?
- Explain why the bond angle in a water molecule is 104.5° , not 109.5° as shown in the model view.
- Explain why the bond angles in some real molecules do not match the bond angle predicted by VSEPR theory – for example, H_2O , SO_2 , ClF_3 , NH_3 , SF_4 , BrF_5 .
- Build a molecule that has an octahedral electron geometry and a square planar molecule geometry.
- Describe the difference between electron and molecule geometry.
- Explain why some molecules have different electron geometries than molecule geometries.

See all published activities for Molecule Shapes [here](#).

For more tips on using PhET sims with your students, see [Tips for Using PhET](#).