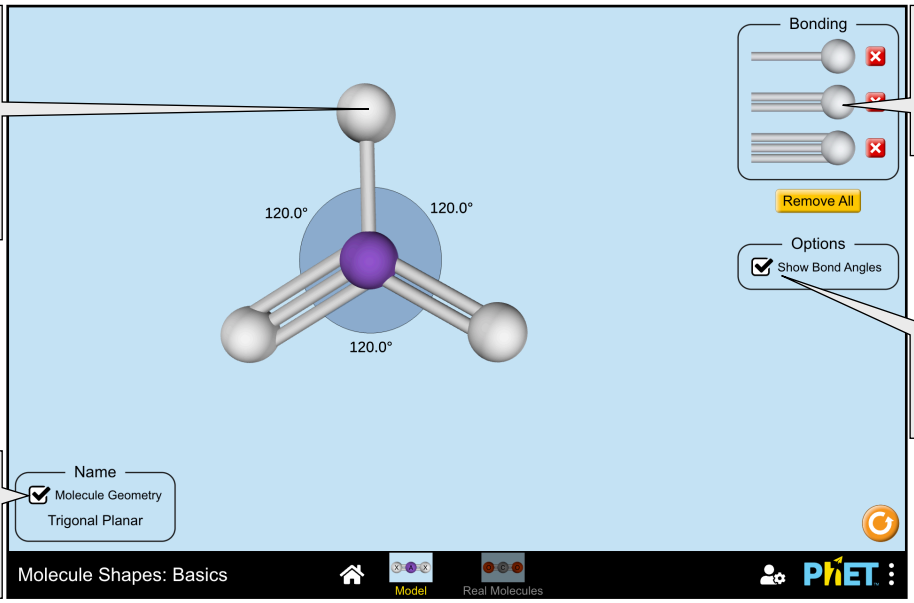
PhET Tips for Teachers

Molecule Shapes: Basics

Model Screen

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

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



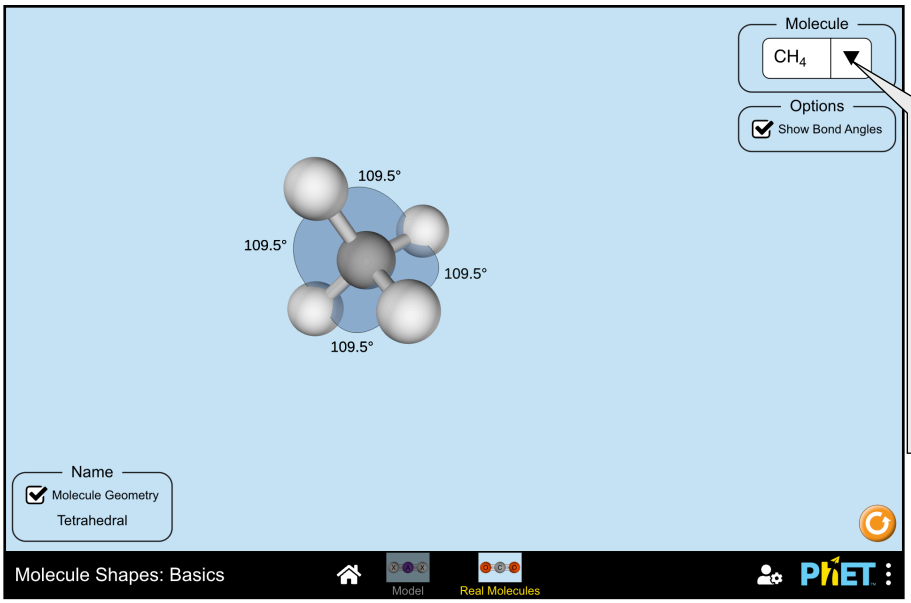
ADD or remove atoms to see effect on shape.

SHOW or hide bond angles.

SHOW or hide molecule geometry.

Real Molecules Screen

Students can investigate the molecular geometry and bond angles of a selected list of real molecules.



SELECT real molecule to view.

- $BeCl_2$
- BF_3
- CH_4
- PCl_5
- SF_6

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Customization Options

Query parameters allow for customization of the simulation, and can be added by appending a '?' to the sim URL, and separating each query parameter with a '&'. The general URL pattern is:
…html?queryParameter1&queryParameter2&queryParameter3

For example, in Molecule Shapes: Basics, if you only want to include the 1st screen (screens=1), and disable pan and zoom (supportsPanAndZoom=false) use:
https://phet.colorado.edu/sims/html/molecule-shapes-basics/latest/molecule-shapes-basics_all.html?screens=1&supportsPanAndZoom=false

To run this in Spanish (locale=es), the URL would become:
https://phet.colorado.edu/sims/html/molecule-shapes-basics/latest/molecule-shapes-basics_all.html?locale=es&screens=1&supportsPanAndZoom=false

⚙ Indicates this customization can be accessed from the Preferences menu within the simulation.

Query Parameter and Description	Example Links
maxConnections - limits the number of atoms (1-6) that can be connected to the central atom on the Model screen, independent of bond order.	maxConnections=4
screens - specifies which screens are included in the sim and their order. Each screen should be separated by a comma. For more information, visit the Help Center.	screens=1 screens=2,1
initialScreen - opens the sim directly to the specified screen, bypassing the home screen.	initialScreen=1 initialScreen=2
⚙ locale - specify the language of the simulation using ISO 639-1 codes. Available locales can be found on the simulation page on the Translations tab. Note: this only works if the simulation URL ends in "_all.html".	locale=es (Spanish) locale=fr (French)
⚙ colorProfile - changes simulation colors for easier projection.	colorProfile=projector
allowLinks - when false, disables links that take students to an external URL. Default is true.	allowLinks=false
supportsPanAndZoom - when false, disables panning and zooming using pinch-to-zoom or browser zoom controls. Default is true.	supportsPanAndZoom=false

Model Simplifications

- The Valence Shell Electron Pair Repulsion (VSEPR) model was used to determine molecule shape for a given number of electron domains.
- When using the Model screen, students investigate the role of bonded atoms in determining molecule shape. The role of lone electron pairs can be investigated using the Molecule Shapes sim.
- On the Model screen, bond angles displayed are those predicted by the basic geometry using the VSEPR model.

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- While the sim prevents students 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 geometry, the building of non-physical structures is allowed to the extent that the learning goals are supported.

Suggestions for Use

Sample Challenge Prompts

- How many different molecule shapes can you make using the simulation?
- Build a molecule that has a trigonal pyramidal molecule geometry.
- Are there cases where atoms are as far apart as but the angles between atoms are not the same? What shapes are these, and why might this happen?

See all published activities for Molecule Shapes: Basics here.
For more tips on using PhET sims with your students, see Tips for Using PhET.