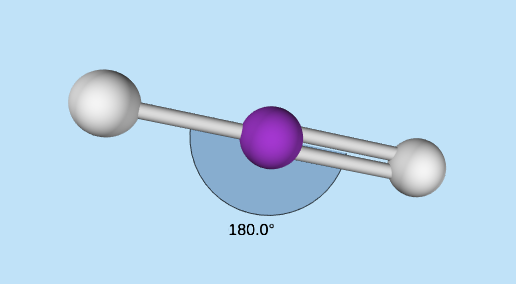
**Molecule Design Challenge**

**Pre-Activity**

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*TSW explain how electron clouds that repel each other still attached to an atom.*

*TSW explain how electrons are used to predict the shape of the molecule.*

*TSW explain the effect of electronegativity on the shape of a molecule.*

1. Open the *Molecule Shapes: Basics* PhET Simulation.

2. Choose “Model.”

3. Check the box “show bond angles.”

4. Try to move one of the gray atoms.   
*What do you notice about the bond angle when you try to do this?*

5. Try to move the purple center atom.

*What do you notice about the bond angle now?*

6. Rotate the molecule so that you can see all sides.

*Provide a geometric shape that describes this molecule.*

7. Add/Remove atoms to create each of the 4 angles below. Be sure to rotate the center atom and observe the molecule from all points of view.   
*Fill in the chart below to record your observations about each molecule.*

|  |  |  |
| --- | --- | --- |
| Bond  Angle | # of Atoms on the Central Atom | Geometric Shape |
| 180 **°** |  |  |
| 109.5 **°** |  |  |
| 120 **°** |  |  |
| 90 **°** |  |  |

8. Create a molecule with 5 atoms on the central atom. Rotate the center atom and observe the molecule.

*How is this molecule different from the 4 molecules above?*

9. Sketch a model of a carbon atom based on your knowledge from the previous 3 units. Be sure to label the number and location of all 3 subatomic particles (including their charge).

10. Examine your response to #4 above and your model from #9. Imagine 2 carbon atoms were near each other.

*Why do you think the atoms of the molecules like to stay in one position?*

Please carefully explain your reasoning.

How sure were you of your answer? (circle one)

Basically Guessed Sure Very Sure

1 2 3 4 5 6 7 8 9 10

11. *Which subatomic particle determines the behavior of atom- how it bonds, when it bonds, if it bonds, what colors it produces, etc.? Why?*

Please carefully explain your reasoning.

How sure were you of your answer? (circle one)

Basically Guessed Sure Very Sure

1 2 3 4 5 6 7 8 9 10