

Chemistry All Around Us!

Week 5: Grades 6-8

Day 5: Molecule Basics

Teacher/Parent Background:

A gold nugget and a tiny drop of water have much in common: both are made of matter that has mass, takes up space, and are pure substances. Pure substances are uniform throughout and have consistent properties such as the atoms of gold throughout the nugget or the molecules of H_2O throughout the drop of water.

Matter may be found as pure substances or as a mixture. Elements, made of a single kind of atom, are pure substances that cannot be broken down into any other substances by chemical or physical means. Only a few elements exist in nature as pure elements. Examples include nitrogen gas (N_2), oxygen gas (O_2), gold (Au), carbon (C), silver (Ag), and copper (Cu).

Matter can exist as elements, compounds, or mixtures. Elements exist either as single elements or chemically combined with other elements in fixed proportions called compounds. Many metals exist in pure element form. Atmospheric oxygen (O) is a gaseous element. When oxygen is chemically combined with hydrogen (H) a compound is made.

Overview:

In this activity students will use a PHeT simulation to discover the answer to the question, "Does the number of atoms bonded or the type of bond have a greater effect on the shape of a molecule?"

Related Standards:

Develop and use a model to demonstrate that atoms and molecules can be combined or rearranged in chemical reactions to form new compounds with the total number of each type of atom conserved.

Key Terms:

- Chemical Bond: An attraction between atoms that enables the formation of chemical compounds.

Materials List:

- Computer and Internet Access
- Student Resource Page

Activity Description:

1. Post the link to the [Molecule Basics PHeT Simulation](#) on your online learning platform.
2. Ask students to follow instructions from the Student Resources handout.

Closure:

Go over answers from the simulation with students:

Type of Bonds	# of Atoms Bonded	Geometric Shape
Single	3	Linear
Single	5	Tetrahedral
Single	7	Octahedral
Double	3	Linear
Double	5	Tetrahedral
Double	7	Octahedral
Triple	3	Linear
Triple	5	Tetrahedral
Triple	7	Octahedral

1. What determines the shape of a molecule? The different number and types of bonds will determine the shape of a molecule

Extensions:

Research and Make Predictions: Ask students, what if a molecule has four atoms, one bond being single, one bond being double, and the third bond being double? Will the shape be different than a molecule with four atoms and all the same kind of bond?

Student Resources

Did you know? When atoms bond to form molecules, they form certain shapes. The shape is important because it affects how the molecule will interact with other molecules.

Does the number of atoms bonded or the type of bond have a greater effect on the shape of a molecule?

Procedure:

1. [Open the Molecules Shapes: Basics simulation practice.](#)
2. Click on model.
3. Check the box for Molecule Geometry at the bottom left corner. This box will then list the geometric shape of each molecule you build.
4. The bonding menu in the top right has three options:
 - a. Single – one bond
 - b. Double – two bonds
 - c. Triple – three bonds
5. Use the bonding menu to build each molecule listed in the data table while recording the geometric shape of each molecule on the data table below:

Type of Bonds	# of Atoms Bonded	Geometric Shape
Single	3	Linear
Single	5	
Single	7	
Double	3	
Double	5	
Double	7	
Triple	3	
Triple	5	
Triple	7	

1. What determines the shape of a molecule?

2. Predict the shape of the compounds below. Then reload the simulator and click "Real Molecules" to see if your predictions were correct.

Compound Formula	# of Atoms	Shape Prediction	Shape According to Simulator
BeCl_2			
CH_4			
SF_6			