

## Building and Naming Molecules

Learning Targets: **I can name a covalent compound, given its formula. I can write the formula of a covalent compound, given its name.**

- Open the <http://phet.colorado.edu/>
- Click the “Play with Sims”.
- Click the “Chemistry” link on the left hand side of the page, then “General Chemistry”.
- Click the “Build a Molecule” simulation. Press “Download” hard disk or “Run” for on-line interaction.
- Stay in the “Make Molecule” Tab for part 1.
- Explore how to make bonds by dragging the atoms and placing them together. Once the bond is formed, you can break the bond by placing the cursor between the atoms. Once you build a structure, you can break all bonds (atomize the particle) by clicking on the blue square, next to the green “3d” toggle.

### PART 1:

#### Kit #1

Draw the Lewis (electron-dot) structure of the hydrogen atom \_\_\_\_\_ and the oxygen atom \_\_\_\_\_.

- Two possible molecules can be built with Kit #1. Build both molecules, and view the space-filling and ball and stick models by clicking the green “3D” toggle .

The element \_\_\_\_\_ , whose molecular formula is \_\_\_\_\_ and Lewis structure is \_\_\_\_\_; and,

the compound \_\_\_\_\_, whose molecular formula is \_\_\_\_\_ and Lewis structure is \_\_\_\_\_.

- Once you have built both molecules, place one of the molecules on the right column by dragging it into the black space and move to the next kit.
- Click on “Reset Kit” to replace the original set of atoms in the bins, build the second molecule, and drag it to the correct black space in the right column.
- Go to Kit #2 by pressing on the Kit #1 “Next” yellow arrowhead.

#### Kit #2

- Four molecules can be built with Kit #2. Two of the molecules are elements, while the other two are compounds. Build the four molecules. Any molecule that is required in the right column may be dragged there. You might need to “Reset Kit” if you make a required molecule to complete the exercise. Make sure you view the space-filling and ball and stick models.

Fill the following table:

Name	Elements		Name	Compounds	
	Formula	Lewis Structure		Molecular Formula	Lewis Structure

- **Go to Kit #3 by pressing on the Kit #3 “Next” yellow, right-hand arrowhead.**

### Kit #3

**Draw the Lewis (electron-dot) structure of the carbon atom \_\_\_\_\_ , the nitrogen atom \_\_\_\_\_, and the oxygen atom \_\_\_\_\_.**

- **More than ten (10) molecules can be built with this kit: Two (2) elements and at least eight (8) compounds. Two of the molecules are required in the right hand tray: carbon dioxide (CO<sub>2</sub>) and nitrogen (N<sub>2</sub>). You should do CO<sub>2</sub> and N<sub>2</sub> as your ninth and tenth molecules.**
- **Build at least ten (10) different molecules, including CO<sub>2</sub> and N<sub>2</sub>. List the names and formulas on the following table. Don't forget to view the space-filling and ball-and-stick models for each molecule. If the molecule contains a double or a triple bond, check (✓) the appropriate column.**

Substance Name	Molecular Formula	Double Bond	Triple Bond	Substance Name	Molecular Formula	Double Bond	Triple Bond

- **Finish the exercise by building CO<sub>2</sub> and N<sub>2</sub> and viewing their “3D” models. Draw the Lewis structure, below, and fill their data on the table. Once you finish your analysis, drag these molecules to the right-hand column.**

**Lewis structures:**       $\text{CO}_2$

$$\mathbf{N}_2$$

## Second, Third, and Fourth Collections

- Complete the following collections, build the fifteen (15) required molecules, and fill the following table with the compound name, formula, and the types of bonds found in the molecule

[illegible]

## PART 2:

## First Tab—Make Molecules

1. Make a molecule:
  - a. How do you know you made a molecule? \_\_\_\_\_
  - b. Write the molecule **name** of some molecules you made (ex. Water).

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2. Molecule Names and Chemical Formulas:
- a. Compare the name and chemical formula for some molecules:

[illegible]

## Second Tab—Collect Multiple

### 3. Make Many

- a. Fill all the collection boxes and then complete the questions for each Goal.

#### Goal: $4\text{H}_2$

Draw it!	
What does the big '4' in $4\text{H}_2$ mean?	
What does the little '2' in $4\text{H}_2$ mean?	

#### Goal: $2\text{CO}_2$

Draw it!	
What does the big '2' in $2\text{CO}_2$ mean?	
What does the little '2' in $2\text{CO}_2$ mean?	

#### Goal: $2\text{O}_2$

Draw it!	
What does the big '2' in $2\text{O}_2$ mean?	
What does the little '2' in $2\text{O}_2$ mean?	

#### Goal: $2\text{NH}_3$

Draw it!	
What does the big '2' in $2\text{NH}_3$ mean?	
What does the little '3' in $2\text{NH}_3$ mean?	

## Third Tab Challenge—Larger Molecules

### 4. What's the biggest molecule you can make?

- a. Molecule Name: \_\_\_\_\_  
b. Chemical formula: \_\_\_\_\_

### 5. Can you make a molecule that can be broken into smaller molecules?

- a. Big molecule **name**: \_\_\_\_\_  
b. Big molecule **chemical formula**: \_\_\_\_\_  
c. Smaller molecule **names**: \_\_\_\_\_  
d. Smaller molecule **chemical formulas**: \_\_\_\_\_