

Making Molecular Models

Chemical formulas of molecules tell us how many atoms of each element there are in a molecule, but they do not convey any sense of the three-dimensional shapes of molecules. In this activity, you will use simple materials to build models of these shapes.

Most elements form a fixed number of bonds—no more and no fewer. For example, a carbon atom forms four bonds, and a hydrogen atom forms one bond. Table 1 lists the number of bonds that each element you will use in this activity can form.

Table 1 Combining Capacity of Some Non-Metals

Element	Symbol	Number of covalent bonds
hydrogen	H	1
chlorine	Cl	1
oxygen	O	2
sulfur	S	2
nitrogen	N	3
carbon	C	4

SKILLS MENU

- | | |
|-------------------------|-----------------|
| ● Questioning | ● Performing |
| ● Hypothesizing | ● Observing |
| ● Predicting | ● Analyzing |
| ● Planning | ● Evaluating |
| ● Controlling Variables | ● Communicating |

Purpose

To build models of some common molecules.

Equipment and Materials

- 1 atomic model kit (Figure 1)

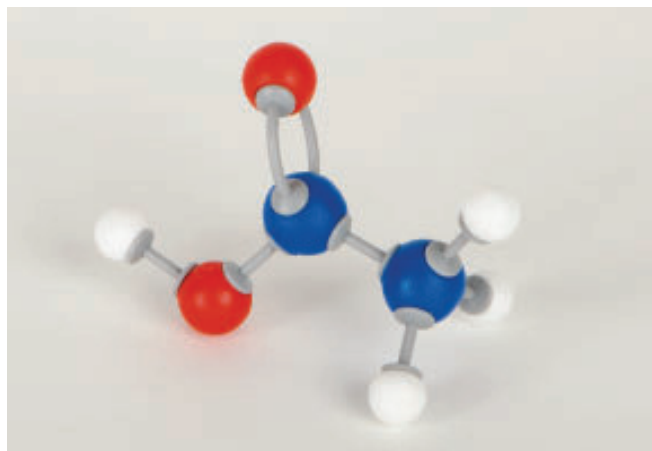


Figure 1 Molecular models allow us to visualize molecules in three dimensions.

Procedure

1. Copy Table 2 (on the next page) into your notebook.
2. Use the “atoms” and “bonds” provided to build a model of each combination of elements listed in your table. You may have to use more than one atom of each type. Count to make sure that each atom in your model contains the correct number of bonds.
3. Count the number of atoms for each element in your model. Write a chemical formula for the molecule in the corresponding column of your table.

WRITING TIP

Recording the Procedure

When writing a science report, use chronological order to organize the steps of the procedure. Number each step. Use a new line for each step. Include all of the steps. Use a verb to begin the description of each step.

Table 2 Building Models of Molecules

Element 1	Element 2	Element 3	Chemical formula	Chemical name	Common name	Common usage
O	O	—				
H	O	—				
N	H	—				
H	Cl	—				
C	O	—				
C	Cl	—				
H	S	—				
C	H	—				
C	H	—	C_3H_8			
H	C	N	HCN			
H	C	O	H_2CO			
C	H	O	CH_3OH			

Analyze and Evaluate

- Look up the chemical name of each molecule in your table and complete the corresponding column in Table 2. T/I
 - Look up the common name of each molecule in your table and complete the corresponding column in Table 2. T/I
- Use the four water molecules you constructed in question (d) to illustrate how water undergoes a chemical change to produce hydrogen (H_2) and oxygen (O_2). Write a short paragraph to summarize your observations. T/I C
 - Based on what you did in questions (d) and (e), compare physical changes and chemical changes. In which type of change are chemical bonds broken or new substances made? Explain your reasoning. T/I



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Apply and Extend

- Look up a common usage for each molecule in your table and complete the corresponding column in Table 2. T/I
- Use your model kit to construct four water molecules. Then use the water molecules to illustrate how water undergoes physical changes when changing to ice and to water vapour. Write a short paragraph to summarize your observations. T/I C



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WRITING TIP

Check and Revise Your Report

When revising a science report, check that the procedure is described as clearly as possible by reading each step aloud and observing as a partner mimes the action. If your partner has difficulty visualizing what to do, then you must change the wording to make the description easier to understand.