3.1 Atoms and Molecules (6.2.1)

Explore this Phenomena

FIGURE 3.4
Salt

FIGURE 3.5
Sugar cubes

Salt and sugar look and feel similar. However, they do not taste similar? Why?

Develop an initial model to explain how matter, such as sugar and salt, may look similar but taste very different.

Standard 6.2.1

Develop models to show that molecules are made of different kinds,proportions and quantities of atoms. Emphasize understanding that there are differences between atoms and molecules, and that certain combinations of atoms form specific molecules. Examples of simple molecules could include water (H_2O), atmospheric oxygen (O_2), and carbon dioxide (CO_2).

TABLE 3.1:

In this section focus on proportions and quantities. There are differences between atoms and molecules. It is important to develop models that show how different proportions and quantities of atoms form different molecules.

Atoms and Molecules

Everything you can see, touch, smell, feel, and taste is made of atoms. Atoms are the basic building-block of all matter (including you and me, and everyone else you'll ever meet), if we want to know about what something is made of, then we have to know a few things about these incredibly small particles.

Smallest Building Blocks

Everyday experiences should convince you that matter is found in many forms, yet all matter you have ever seen is made of atoms. Atoms are the smallest unit of matter. These atoms combine to form molecules, which can be made up of the same or different types of atoms. Molecules are formed when two or more atoms link up. For instance, a molecule of oxygen that we breath is made of two atoms of oxygen (O_2). A molecule of water is made of two atoms of hydrogen (H_2) and one atom of oxygen (O). All water molecules have the same ratio: two hydrogen to one oxygen (H_2O). The figure on the right shows a water molecule that has two hydrogen atoms (shown in gray) bonded to one oxygen atom (shown in red).

To help develop your model of of atoms and molecules, think of interlocking building blocks. Each block is individual with its own color, shape, and size like an atom. You can combine these blocks together to form a simple structure like a molecule.

Two things are important to know about molecules:

- A molecule always has the same type of atoms in the same proportions. For example, carbon dioxide always has two atoms of oxygen for each atom of carbon, and water always has two atoms of hydrogen for each atom of oxygen.

- A pure substance always has the same composition throughout. For example, all the water in the ocean has the same type and proportion of atoms.

Properties of Molecules

The properties of a molecule are different from the properties of the atoms that form them. That's because atoms in a molecule combine and become an entirely different substance with its own unique properties. Do you put salt on your food? Table salt is the molecule sodium chloride. A molecule of table salt, contains an atom of sodium and an atom of chlorine. As shown in the figure below, sodium is a solid that reacts explosively with water, and chlorine is a poisonous gas. But together in table salt, sodium and chlorine form a harmless unreactive compound that you can safely eat.

Focus Questions

- How would a model of an atom and molecule be different?
- How would you model a carbon dioxide molecule that has one atom of carbon and two atoms of oxygen (CO_2)?

Putting It Together

FIGURE 3.6

FIGURE 3.7

Review your initial model. Based on what you have learned, draw a revised model to explain how matter, such as sugar and salt, may look similar but taste very different. Be sure to add labels or captions to your revised model.