Modeling Molecules

Cross-Disciplinary Extensions

Connect to Math
Have students use their research from Part A to describe the composition of each substance in different ways. For example,

- What is the ratio of hydrogen atoms to oxygen atoms in water? [2:1] In hydrogen peroxide? [1:1]
- In a salt crystal, what percentage of atoms are sodium atoms? [50%]
- In silica, what fraction of the atoms are oxygen atoms? [2/3]
- If hydrogen has an atomic weight of 1 and oxygen has an atomic weight of 16, what is the molecular weight of water? [(2 hydrogen atoms x 1) + (1 oxygen atom x 16) = 18]

Connect to Social Studies
Have students conduct research to find out more about diamond or graphite. What are they used for? What countries are they found in? How do people get them out of the ground? How important are they to the economy of the countries where they are mined? What is life like for miners?

Next Generation Science Standards
This lesson supports the following:

Practices of Science and Engineering
- Developing and Using models
- Analyzing and interpreting data
- Constructing explanations
- Using mathematical and computational thinking
- Obtaining, evaluating, and communicating information

Crosscutting Concepts
- Patterns
- Cause and Effect: Mechanism and Explanation
- Scale, Proportion, and Quantity
- Structure and Function

Disciplinary Core Ideas, Grades 3-5

Physical science
- Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model shows that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon; the effects of air on larger particles or objects. (5-PS1-1)
- Measurements of a variety of properties can be used to identify materials. (5-PS1-3)
**Engineering Design**

- Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (3-5-ETS1-1) (secondary to 4-PS3-4)

- At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (3-5-ETS1-2)

- Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (3-5-ETS1-3) (secondary to 4-PS4-3)