3-2 What are atoms?

Objectives

Identify an atom as the smallest part of an element that can be identified as that element.
List the main parts of Dalton's atomic theory.

Key Term

atom: smallest part of an element that can be identified as that element

Atoms The element silicon cannot be broken down into a simpler type of matter. But what would happen if you took a piece of silicon and cut it into smaller and smaller pieces? There would be a piece of silicon so small that it could not be further divided. This smallest piece of the element silicon is called an atom. An **atom** is the smallest part of an element that can be identified as that element.

1 **INFER:** What would happen if you cut a piece of an element into smaller and smaller pieces?

Democritus The first person to suggest the idea of atoms was the Greek philosopher Democritus (dih-MAHK-ruh-tuhs). More than 2,400 years ago, Democritus asked whether it is possible to divide a sample of matter forever into smaller and smaller pieces. After much observation, he came to the conclusion that it is not possible to divide matter forever. At some point, a smallest piece of matter would be reached. Democritus named this smallest piece of matter an atom. The word *atom* comes from a Greek word that means "cannot be divided."

Democritus and his students did not know what atoms looked liked. They did not know what scientists today know about atoms. However, they hypothesized that atoms were small, hard particles that were all made out of the same material but were of different shapes and sizes. They also thought that atoms were infinite in number, that they were always moving, and that they could be joined together.

2 **STATE:** What does the word *atom* mean?

Dalton's Atomic Theory In the early 1800s, an English chemist named John Dalton performed some experiments. He investigated properties of gases. His observations led him to believe that gases are made of individual particles. These individual particles are very similar to the idea of the atom proposed by Democritus. The results of his experiments and other observations about matter led Dalton to state an atomic theory of matter. The main parts of Dalton's atomic theory of matter are as follows:

- All elements are composed of atoms. Atoms cannot be divided or destroyed.
- Atoms of the same element are exactly alike.
- Atoms of different elements are different from each other.
- The atoms of two or more elements can join together to form types of matter called compounds.

Like Democritus, Dalton had some ideas about atoms that scientists no longer agree with. However, Dalton's atomic theory was the beginning of the modern theory of atoms.

▲ **Figure 3-6** John Dalton

3 **LIST:** What are the main parts of Dalton's atomic theory of matter?

Name _____ Class _____ Date _____

3-2 What are atoms?

Lesson Review

Write *true* if the statement is true. If the statement is false, change the underlined term to make the statement true. Write your answers in the spaces provided.

_____ 1. A piece of copper cannot be broken down into some simpler type of matter.

_____ 2. The atomic theory states that atoms of two or more elements can join together to form other elements.

_____ 3. The first person to suggest the idea of atoms was Dalton.

_____ 4. All elements are composed of atoms.

_____ 5. The word *element* comes from a Greek word that means "cannot be divided."

_____ 6. The smallest part of an element that can be identified as that element is an atom.

_____ 7. Atoms of different elements are the same.

_____ 8. The atomic theory states that atoms can be destroyed.

_____ 9. Democritus and his students thought that atoms were always moving.

_____ 10. A modern atomic theory was stated by Democritus.

Skill Challenge

Skills: *interpreting, analyzing*

The table below lists the four main parts of Dalton's atomic theory. In the spaces provided, write which part of the atomic theory supports the given statement.

DALTON'S ATOMIC THEORY
1. All elements are composed of atoms. Atoms cannot be divided or destroyed.
2. Atoms of the same element are exactly alike.
3. Atoms of different elements are different from each other.
4. The atoms of two or more elements can join together to form types of matter called compounds.

_____ 1. Atoms of sodium can combine with atoms of chlorine to form table salt.

_____ 2. Every calcium atom has the same number of protons.

_____ 3. All neon atoms have the same number of electrons.

_____ 4. Hydrogen atoms can combine with oxygen atoms to form water.

_____ 5. An atom of hydrogen weighs much less than an atom of silver.