

## What's the Matter?

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<b>Strand</b>	Matter
<b>Topic</b>	Investigating atoms, elements, molecules, and compounds
<b>Primary SOL</b>	5.4 The student will investigate and understand that matter is anything that has mass and takes up space; and occurs as a solid, liquid, or gas. Key concepts include c) atoms and elements; d) molecules and compounds.
<b>Related SOL</b>	5.4 The student will investigate and understand that matter is anything that has mass and takes up space; and occurs as a solid, liquid, or gas. Key concepts include a) distinguishing properties of each phase of matter.

### Background Information

Atoms are the building blocks of matter.

- **Atoms.** All matter is made up of atoms, which are so small that they can be seen only by using a very strong microscope. All atoms have the same basic parts including protons, neutrons, and electrons. Protons and neutrons form the nucleus in the center of the atom, while electrons orbit quickly around the nucleus. The majority of the mass of an atom is in its nucleus. Atoms of different elements differ in the number of protons, electrons and neutrons they have, and this affects their mass.
- **Elements.** One atom of an element is the smallest unit of an element that retains the properties of that element. Atoms combine to form elements. Each element is given a name, such as hydrogen, gold, silver, helium, and iron, along with a symbol. The element's name and symbol identify it. Most, but not all, of these symbols are taken from the first or first and second letters of the name of the element, such as H for hydrogen and Ca for calcium. Each atom of a particular element is alike in having the same number of protons in its nucleus. This number is the element's *atomic number*. For example, any atom that contains exactly 47 protons in its nucleus is an atom of silver. Any atom that contains only one proton is an atom of hydrogen, the lightest element.
- **Molecules.** Two or more atoms that are held together form a molecule. Two atoms of the same element can join together to form a molecule of that element. Molecules are always in motion in each of the three phases of matter, and the speed of the molecules determines the matter's phase. For example, if the molecules are spread far apart, are moving very fast, and bouncing off one another, the matter of which they are a part is a gas. If they are packed close together and barely moving, they are a part of a solid. If the molecules are moving freely around each other, they are a part of a liquid, which can be poured.
- **Compounds.** Atoms of two or more elements join together to form a compound. Water is an example of a compound, since it is made up of hydrogen and oxygen atoms.

## Materials

- Copies of attached worksheet “What’s the Matter?”
- Drawing paper
- Markers, crayons, or colored pencils
- Resources, such as science books, Internet, or books from the library
- Copies of attached worksheet “An Atom of my Element”

## Vocabulary

*atoms, elements, molecules, compounds*

## Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

### Introduction

1. Begin by finding out what students already know about matter with a prelearning activity such as a KWL chart (what students “know,” “want to know,” and “learned” as a result of the lesson). Students should know that matter occurs in three phases: solid, liquid, and gas.
2. Ask students what the building blocks of matter are. Define and explain the characteristics of atoms, elements, molecules, and compounds by handing out the visual diagram worksheet What’s the Matter to help students visualize each term.

### Procedure

1. Place students into groups of four. Assign each student in a group one of the four terms: atoms, elements, molecules, and compounds.
2. Have students create a visual representation of the term they have been assigned. They will use the drawing paper and markers, crayons, or colored pencils. They should use color and add a key that identifies each part of their drawing (protons, neutrons, etc.). They should *not* label the drawing as to which of the four terms it represents. Students should have time to find pictures of atoms, elements, molecules, and compounds, either in their science books, on the Internet, or in books from the library.
3. As students are finished, have them hang the drawings on the wall and label each of them with a letter of the alphabet.

### Observations and Conclusions

1. Have students or groups identify each picture as an atom, molecule, compound, or element. Have them share the reasons for their decisions either with a partner or with the class.

## Assessment

- **Questions**
  - What are the building blocks of matter?
  - In what order would the four terms be in order from smallest to largest?
- **Journal/writing prompts**
  - Explain the difference between atoms, molecules, compounds, and elements.

- Explain the parts of the term you were assigned. How do they compare to the other terms?
- **Other**
  - Give students pictures of atoms, molecules, elements, and compounds, and have them identify each.
  - Evaluate the students' identifications of the drawings for accuracy.
  - Evaluate the students' drawings for required elements.

### **Extensions and Connections (for all students)**

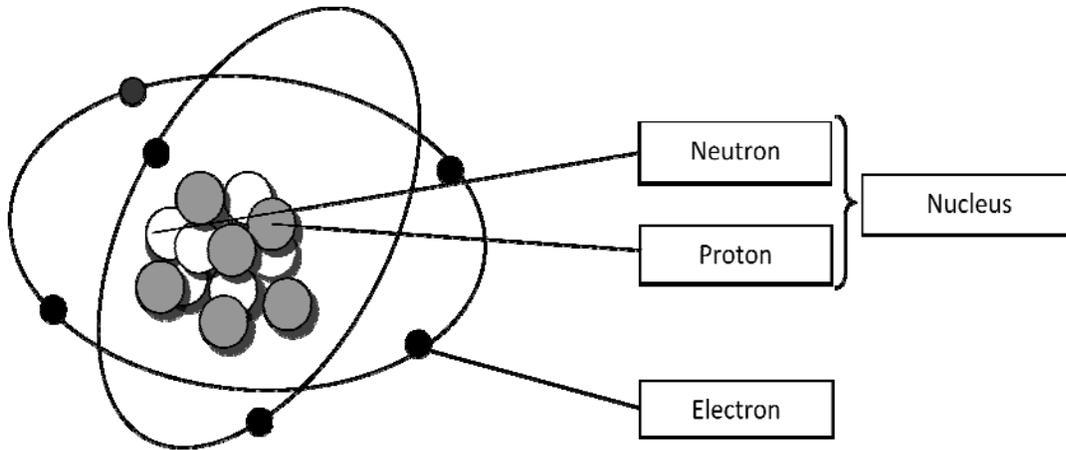
- Have the students build three-dimensional models rather than make drawings. Alternatively, they could build models from their drawings.
- Have the students build a variety of element models using marshmallows to extend this lesson.
- Assign each student a different element from the Periodic Table and have them use the attached worksheet "An Atom of my Element" to learn about the different elements.

### **Strategies for Differentiation**

- For students with a visual impairment, use a chip that is flat to represent protons, electrons, and neutrons. Use puff paint to label the chips with a + for positive, - for negative, and an = for neutral. This will allow the students to know what each chip represents.
- Act out atoms versus molecules by linking arms if it is a molecule such as NaCl (salt) or standing alone as an atom such as carbon.
- Make additional models using round manipulatives (e.g., gum drops, toothpicks, Styrofoam balls, clay, marbles, plastic eggs, etc.)
- Create a comparison matrix. Divide students in groups and direct the groups to discuss and answer the following questions on each term: atoms, elements, molecules, and compounds, "What are they?" "What do they look like?" "How are they alike?" "How are they different?"

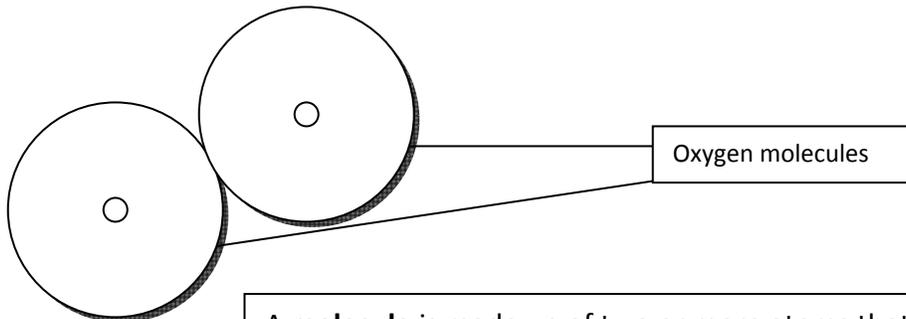
# What's the Matter?

## Atom



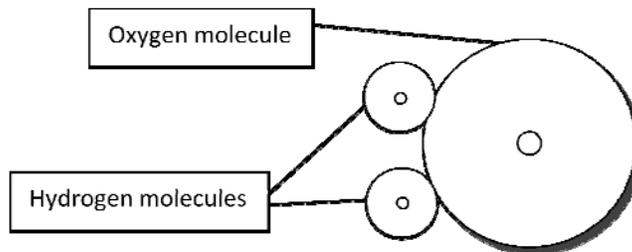
An **atom** is made up of three kinds of particles — protons, neutrons, and electrons.

## Molecule



A **molecule** is made up of two or more atoms that are held together. Two atoms of the same element joined together form a molecule of that element.

## Compound

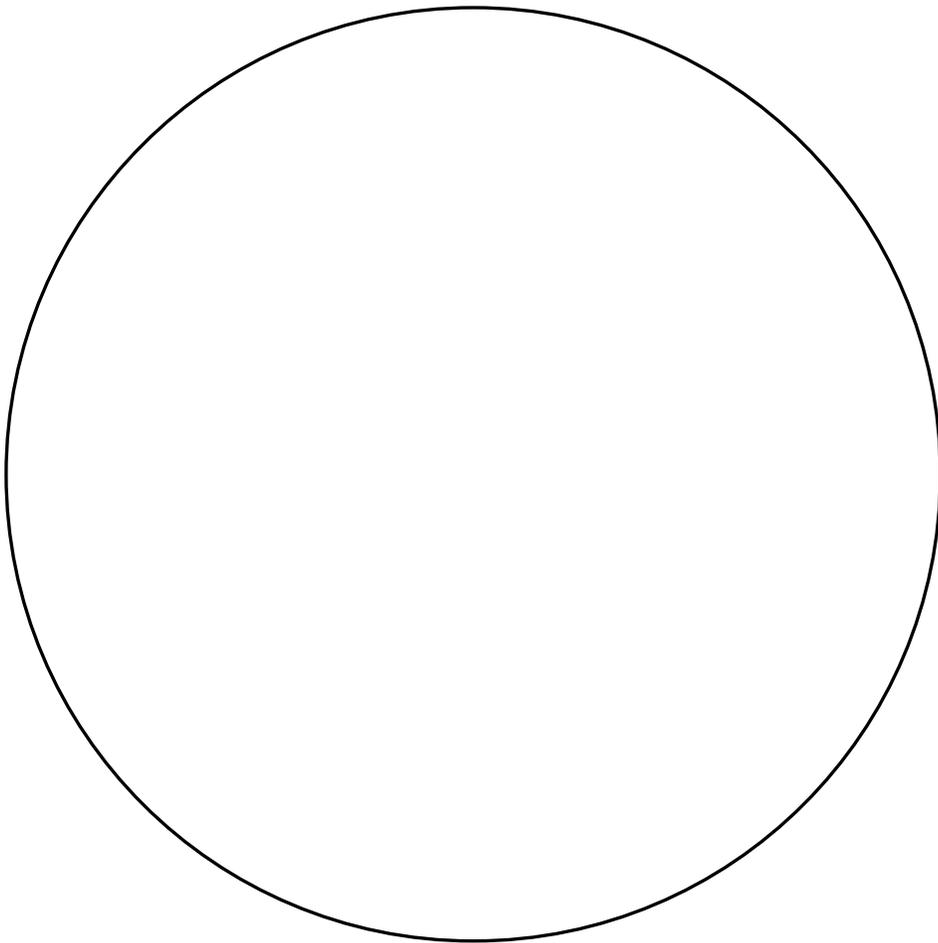


A **compound** is made up of atoms of two or more elements joined together. For example, water is a compound formed from joining two hydrogen molecules and one oxygen molecule.

# An Atom of My Element

Name: \_\_\_\_\_ Date: \_\_\_\_\_

In the circle below, draw a picture of one atom of your element, including the protons and neutrons in its nucleus and the electrons in orbit around its nucleus. Use a different color for each part of the atom.



Fill in the basic information about the atom:

Name of element: \_\_\_\_\_

Number of neutrons in the nucleus: \_\_\_\_\_

Number of protons in the nucleus: \_\_\_\_\_

Number of electrons: \_\_\_\_\_

Atomic symbol: \_\_\_\_\_

Uses of element: \_\_\_\_\_