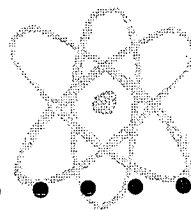
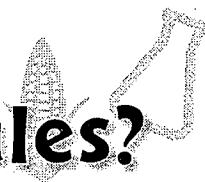




# What Are Molecules?



1. Circle **T** if the statement is TRUE or **F** if it is FALSE.

**T** **F** a) Connecting links between atoms are called **bonds**.

**T** **F** b) Atoms contain more than one molecule.

**T** **F** c) All particles in a pure material are the same.

**T** **F** d) Outer electrons form links that hold atoms together.

**T** **F** e) New molecules are formed during physical changes.

2. Put a check mark (✓) next to the answer that is most correct.

a) All organic molecules contain the element

- ☐ A calcium
- ☐ B carbon
- ☐ C iron
- ☐ D nitrogen

b) Which is true of all polymer molecules?

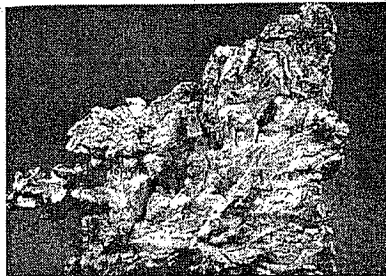
- ☐ A They are all gases.
- ☐ B They are all very long.
- ☐ C They can all be used as fuel.
- ☐ D They are all made in factories.

c) Which of these contains one or more bond?

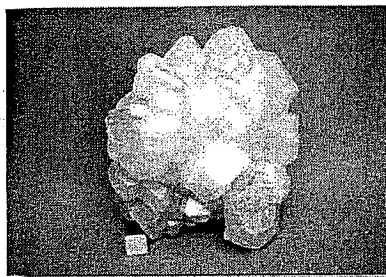
- ☐ A all atoms
- ☐ B all materials
- ☐ C all molecules
- ☐ D all particles



# What Are Molecules?



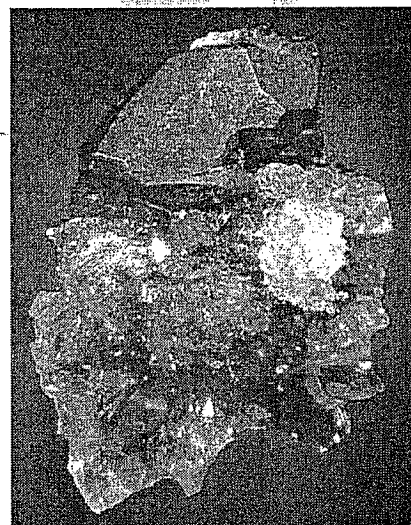
Silver



Sulfur

**S**ome atoms are separate from each other and other atoms are fastened together. Groups of atoms fastened together are called **molecules**. When atoms fasten together to form molecules it is called a chemical change. When molecules break up into separate atoms, that is a chemical change too.

In molecules, atoms are held together by connecting links. These links are called **bonds**. Atoms become connected when some of the



Silver atoms bond to sulfur atoms to form silver sulfide

electrons from each atom act together

to form a bond. Not all electrons can help form bonds. Only the electrons farthest from the nucleus form bonds. Also, not all atoms can bond together. The atoms must have the right number of electrons with the right energy to form a bond. The pictures show what happens when silver atoms bond to sulfur atoms to form silver sulfide.

**Complete these sentences by filling the blanks with the words below. Use each word once.**

STOP

chemical

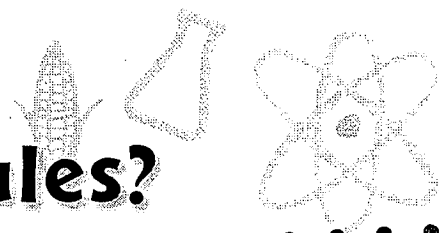
molecules

atoms

Bonds connect \_\_\_\_\_ to form \_\_\_\_\_. A \_\_\_\_\_ change happens whenever bonds are formed or broken.

Atoms and molecules are two kinds of **particles**. When all the particles in something are the same, it is called a **pure material**. All the particles in pure gold are gold atoms. All the particles in pure water are water molecules.

Scientists often use **chemical symbols** instead of names to talk about atoms. For an atom of oxygen they write "O". For an atom of sulfur they write "S". For some atoms the symbol is a big letter and a little letter. Aluminum is "Al". The symbol can mean just one atom or it can mean a material made of those atoms.



## What Are Molecules?

**M**olecules are made of two or more atoms bonded together. The atoms in a molecule can be different or they can be the same. Oxygen in the air is made of oxygen molecules. An oxygen molecule is two oxygen atoms bonded together. Molecules of water are made of two kinds of atoms. Every water molecule has two hydrogen atoms and one oxygen atom.

Oxygen and water are small molecules. Many of the molecules that make up living things are much larger. Some molecules are made of hundreds or even thousands of atoms! Even these large molecules are much too small to see.

Most molecules in living things are called **organic** molecules. One thing is the same for all organic molecules. They all contain atoms of carbon. Another kind of molecules are called **polymers**. These are very long molecules. Polymer molecules become long by repeating the same small group of atoms over and over. Our clothes are made mostly of polymers. Some of these come from nature, like cotton and wool. Others are made in factories, like nylon and rayon. All these kinds of cloth are made of very long polymer molecules.



# What Are Molecules?

1. Circle **T** if the statement is TRUE or **F** if it is FALSE.

- T** **F** a) Water molecules are polymers.
- T** **F** b) Sodium chloride is an organic molecule.
- T** **F** c) The letter "O" can mean "one oxygen atom."
- T** **F** d) A "pure material" can contain many kinds of molecules as long as they are pure.
- T** **F** e) Chemical bonds between atoms are formed by outer protons.
- T** **F** f) Any atom can form a molecule with any other atom.

2. Write each word beside its meaning. Some words will not be used.

bond	material	molecule
organic	polymer	symbol

- \_\_\_\_\_ a) a short way to write the name of an atom
- \_\_\_\_\_ b) the connecting link between atoms on a molecule
- \_\_\_\_\_ c) a molecule that contains carbon
- \_\_\_\_\_ d) a long molecule with repeating groups of atoms

3. When two atoms bond together to form a molecule, which parts of the atoms become part of the bond?

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# What are Molecules?



What is an *organic* molecule?

\_\_\_\_\_

What is a *polymer*?

\_\_\_\_\_

\_\_\_\_\_

## Applications

Identify materials and molecules by studying the materials around you. Some things you are made of separate atoms. Others are made of molecules. All of them are **pure materials**. Some are made of **atoms**, and some are made of **molecules**.

water	oxygen	helium	neon	aluminum
silver	rust	charcoal	sugar	

Complete a chart like the one below:

A. MADE OF ATOMS		B. MADE OF MOLECULES	
Scientific Name	Common Name	Scientific Name	Common Name



# What are Molecules?

4. What is part of every *organic* molecule?

---

---

5. What kind of molecule is a *polymer*?

---

---

## Extensions & Applications

6. Learn more about atoms and molecules by studying the materials around you. Some things you often see around you are made of separate atoms. Others are made of molecules. All of the materials listed below are **pure materials**. Some are made of **atoms**, and some are made of **molecules**.

iron	water	oxygen	helium	neon	aluminum
baking soda	silver	rust	charcoal	sugar	

For this activity make a chart like the one below:

A. MADE OF SEPARATE ATOMS		B. MADE OF MOLECULES	
Common Name	Scientific Name	Common Name	Scientific Name

Put each material above in the correct list.

Some of these materials have scientific names. For those that do, write the **scientific name** next to its common name. Looking the names up in a large dictionary will help with some of the materials. Your teacher may also be able to tell you books or websites that will help. See if you can find any other pure materials to **add** to the list. Try looking in the bathroom, kitchen, classroom, supermarket, and outdoors.



# What Are Elements?

1. Circle **T** if the statement is TRUE or **F** if it is FALSE.

T F a) There are about 100 different kinds of atoms.

T F b) Molecules contain two or more atoms.

T F c) Fire, air, earth, and water are all elements.

T F d) Forming rust is a chemical property of iron.

T F e) All atoms have the same number of electrons.

T F f) All atoms are the same size.

2. Draw one line from each word on the left to its meaning.

bonds

a

the parts of an atom equal in number to the atom's electrons

chemical

b

the properties that tell how and when an atom forms molecules

electrons

c

the connections that hold atoms together

elements

d

materials made of one kind of atom

protons

e

the parts of an atom that circle the nucleus



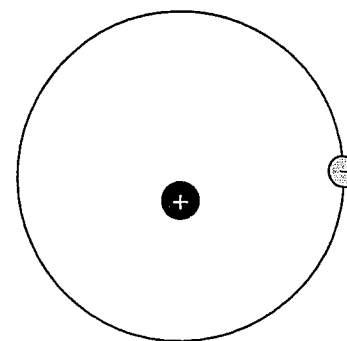
# What Are Elements?

## Atoms of the Two Simplest Elements

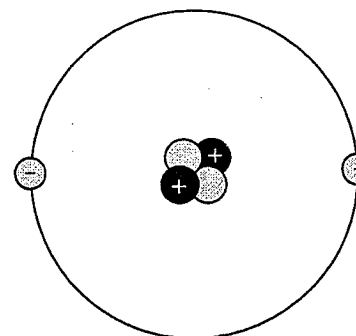
**Y**ou learned earlier that there are about 100 kinds of atoms. A material made of only one kind of atom is called an **element**. Some elements you may know about are iron in nails, helium in balloons, and iodine in medicines.

The atoms of each element have different chemical and physical properties. But why are the atoms different? Atoms of each element have a different number of protons in their nucleus. Hydrogen is the simplest element. Its atoms have only one proton. Uranium has much larger atoms with 92 protons.

Remember that the number of protons in an atom equals the number of electrons. Hydrogen atoms have one electron and uranium atoms have 92 electrons. The number of electrons in the atoms of an element give the element its chemical properties. This is because different numbers of electrons cause atoms to form bonds in different ways.



A Hydrogen Atom



A Helium Atom

**Name TWO things that are different about atoms of different elements.**



Elements can be made of single atoms, or they can be made of molecules. The helium in helium balloons is made of separate atoms. You may remember that oxygen we breathe is made of molecules that have two oxygen atoms bonded together.

Long ago people thought there were only four elements: fire, air, earth, and water. Now we know that none of these are elements. Water molecules are made of hydrogen and oxygen atoms. The other three are mixtures of different molecules.



# What Are Elements?

1. Put a check mark (✓) next to the answer that is most correct.

a) How many elements are there?

- ☐ A three
- ☐ B four
- ☐ C about 100
- ☐ D many millions

b) Why do all atoms of an element have the same chemical properties?

- ☐ A They all have the same size electrons.
- ☐ B Their electrons all have the same charge.
- ☐ C They all have the same number of neutrons.
- ☐ D They all have the same number of electrons.

c) Long ago, people believed there were four elements: fire, air, earth, and water. How many of these are called elements today?

- ☐ A none
- ☐ B one
- ☐ C two
- ☐ D three

2. a) Circle the words that are the names of elements.

air      helium      hydrogen      iron      sunlight      water

b) Underline the words that are made of elements but are not elements.

air      helium      hydrogen      iron      sunlight      water



# What Are Elements?

3. Tell what an *element* is. Use the word "atoms" in your answer.

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4. What is the *simplest* element?

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---

5. Name *two* other elements.

---

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## Extensions & Applications

6. Look back at the pictures of the atoms of hydrogen and helium. Hydrogen has one proton in its nucleus circled by one electron. Helium has two protons and two neutrons in its nucleus circled by two electrons.

Make drawings of atoms of the elements **carbon** and **lithium**. For both atoms, put the first two electrons in an inner circle and the other electrons in an outer circle.

Carbon has six protons and six neutrons in its nucleus, circled by six electrons.

Lithium has three protons and four neutrons in its nucleus. You will have to figure out how many electrons circle the nucleus of a lithium atom.

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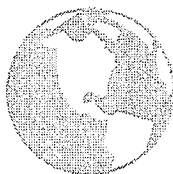
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# What Are Compounds?

1. **Circle T** if the statement is **TRUE** or **F** if it is **FALSE**.

- T F a) Atoms are made of molecules.
- T F b) Molecules and atoms are particles.
- T F c) Pure materials are made of one kind of particle.
- T F d) Atoms can be thought of as the building blocks of matter.
- T F e) Water is an element.
- T F f) Electrons are one kind of atom.

2. Put a check mark (✓) next to the answer that is most correct.

a) Which of these is an element?

- ☐ A air
- ☐ B gold
- ☐ C sugar
- ☐ D water

b) Which of these is made of more than one atom?

- ☐ A a bond
- ☐ B a nucleus
- ☐ C a molecule
- ☐ D an electron

c) There are about 100 different

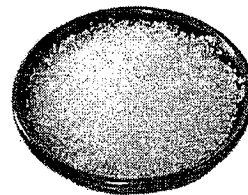
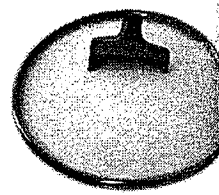
- ☐ A electrons.
- ☐ B elements.
- ☐ C molecules.
- ☐ D particles.



# What Are Compounds?

**Y**ou have learned that molecules are particles made of more than one atom. If the atoms in the molecules of a material are the same, the material is an element. If the atoms in the molecules of a material are different, the material is a **compound**.

Remember that atoms and molecules are very small particles. Elements and compounds are materials made of many particles. The particles in a compound are always molecules, not atoms. Because the particles of a molecule have more than one kind of atom, they must have more than one atom. Particles with more than one atom are molecules.

**Oxygen****Salt****Sugar**

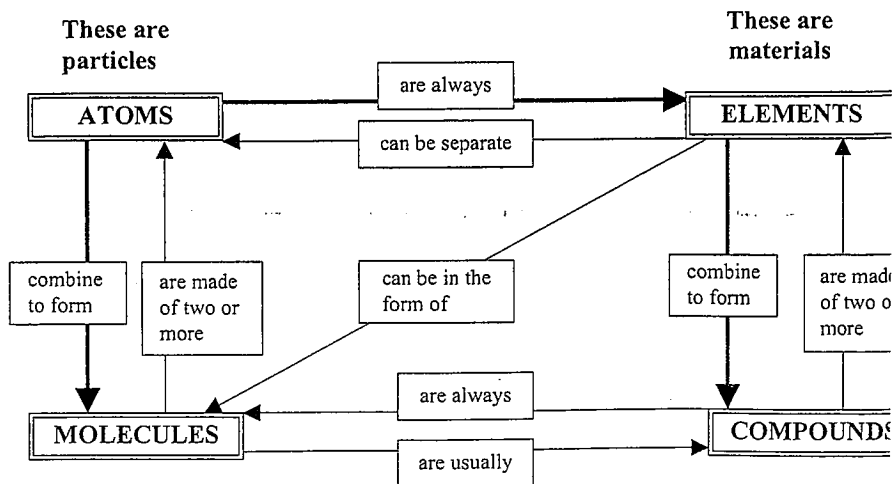
**Explain why water is a COMPOUND and not an element.**

Remember we learned that all pure materials are made of just one kind of atom or just one kind of molecule. Also pure materials are made of only one element or only one compound.

These are some common elements you may have heard of: hydrogen, helium, carbon, nitrogen, oxygen, neon, aluminum, chlorine, calcium, nickel, copper, silver, iodine, gold, tin, mercury, and lead.

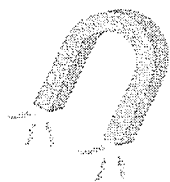
These are some common compounds you may have heard of: salt, sugar, water, rust, and carbon dioxide.

We have been studying four words that are easy to confuse: atoms, molecules, elements, and compounds. This diagram may help you keep them straight. Follow the direction that the arrows point to make sentences. For example, at the top: "**ATOMS** are always **ELEMENTS**." The most important sentences have thick arrows.



NAME: \_\_\_\_\_

After You Read 



# What Are Compounds?



1. Use the words in the list to answer each question.

atoms	molecules	elements
compounds	particles	pure materials

- \_\_\_\_\_ a) Which particles make up all elements?
- \_\_\_\_\_ b) Which particles are always made of more than one atom?
- \_\_\_\_\_ c) What is made of one kind of atom or one kind of molecule?
- \_\_\_\_\_ d) Which materials are made of one kind of atom?
- \_\_\_\_\_ e) What are single atoms or single molecules called?
- \_\_\_\_\_ f) Which materials are made of more than one element?

2. a) **Circle** the words that are elements.

aluminum  
rust

salt  
copper

sugar  
gold

oxygen  
water

b) **Underline** the words that are compounds.

aluminum  
rust

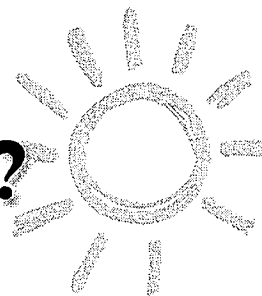
salt  
copper

sugar  
gold

oxygen  
water



# What are Compounds?



3. Tell what elements are using the word "atom."

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4. Tell what molecules are using the word "atom."

---

---

5. Tell what compounds are using the word "element."

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## Extensions & Applications

6. Find out what **elements** have combined to form some of the **common compounds** you see around you. You may have to look them up in the dictionary, a science book, or on the Internet. Ask your teacher for the best place to look.

**Find the elements that make up these compounds:**

a) water

---

b) glass (It is the same compound as sand.)

---

c) sugar

---

d) Try to find **two** more materials you think are compounds. Read about them to see if they really are compounds. If they are compounds, find which elements are in them. See if they have scientific names.

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# Matter - Introduction

By Sharon Fabian



chemists	useful	worthless	nugget
chemist	helium	possible	buoyancy
boiling	solubility	fact	dissolve
squashed	knowing	hardness	shaker

**Directions:** Fill in each blank with the word that best completes the reading comprehension.

A long time ago, some people got the idea to use science to change  
(1) \_\_\_\_\_ metals into gold! Their new "science" was called alchemy. Then some other people, those who were thinking more logically, proved that it just wasn't (2) \_\_\_\_\_. Science may be amazing, but it can't really cause miracles. You can't change a cheap metal into gold; science and nature have their own rules which are not to be broken!



Gold, iron, tin, other metals, and other objects and materials are all what scientists call matter. One definition of matter is anything that takes up space. So elephants and hippos are made of matter. So are ants and fleas. Rocks, trees, clouds, ocean water, ocean liners, diamond rings, iron nails, plastic Easter eggs, milkshakes, and the helium in a Happy Birthday balloon -- all are made of matter.

Just like other fields of science, the study of matter has rules. The branch of science that studies all of the rules involving matter is called chemistry.

(3) \_\_\_\_\_ often start their study of matter by looking at some of its properties. Properties are details that describe a particular type of matter. You might also call them qualities or characteristics. One property of a diamond is its (4) \_\_\_\_\_. One property of a (5) \_\_\_\_\_ balloon is that it is lighter than air. A property of elephants, hippos, ants, and fleas is that their bodies contain the chemical carbon.

Color, hardness, odor, and shape are a few of the properties of matter. Mass is another one. Mass is similar to weight; it tells how much matter is in something. Another property is called density. Density tells how tightly the matter is packed together. For example, if you took a loaf of bread and

(6) \_\_\_\_\_ it up really small, it would still have the same mass as before, but it would have a lot more density. There are many more properties. (7) \_\_\_\_\_ tells how well an object will float. Solubility tells if something will dissolve in water or another liquid. Elasticity tells how well it will stretch. Viscosity tells if it will flow fast like water, or slow like syrup. Brittleness tells if something will snap into two pieces. The freezing point and

(8) \_\_\_\_\_ point of a material are two more of its properties.

(9) \_\_\_\_\_ a little bit about matter and its properties would have saved the alchemists a lot of trouble. It could also save you from another mistake if you ever go mining for gold.

Have you ever heard of fool's gold? It is shiny, hard, and gold-colored like real gold. In (10) \_\_\_\_\_ it has many of the same properties as gold. But it is not gold, and you can tell the difference by using the property of (11) \_\_\_\_\_. Real gold does not (12) \_\_\_\_\_ in acid, but fool's gold does. So if you find a bright shiny nugget, but you're not sure if it's real gold or fool's gold, take it to a (13) \_\_\_\_\_ and have them put your (14) \_\_\_\_\_ into some acid. If it's real gold, it will still be there. If it's fool's gold, it will just melt away!

The science of chemistry can tell us all kinds of (15) \_\_\_\_\_ things. How could you use the properties of matter to tell the difference between a diamond and a diamond-shaped piece of glass? Can you think of a way to determine if a (16) \_\_\_\_\_ in your kitchen contains grains of sugar or grains of salt? Just think like a scientist, and remember the properties of matter.

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Name \_\_\_\_\_



Date \_\_\_\_\_

## Matter - Introduction

1. Anything that takes up space is called <input type="radio"/> A Nature <input type="radio"/> B Metal <input type="radio"/> C Matter <input type="radio"/> D Chemicals	2. The branch of science that studies matter and its properties is <input type="radio"/> A Earth science <input type="radio"/> B Chemistry <input type="radio"/> C Biology <input type="radio"/> D Geology
3. Color, hardness, viscosity, and brittleness are <input type="radio"/> A Types of matter <input type="radio"/> B Types of energy <input type="radio"/> C Properties of energy <input type="radio"/> D Properties of matter	4. Inexpensive metals can be changed into gold. <input type="radio"/> A True <input type="radio"/> B False
5. Fool's gold is one kind of real gold. <input type="radio"/> A True <input type="radio"/> B False	6. Solubility describes how well an object will float. <input type="radio"/> A True <input type="radio"/> B False
7. Viscosity tells how fast a liquid will flow. <input type="radio"/> A True <input type="radio"/> B False	8. A raindrop is made of matter. <input type="radio"/> A True <input type="radio"/> B False

Name \_\_\_\_\_



Date \_\_\_\_\_  
(Key 1 - Answer ID # 0150551)

Make words by connecting the syllables.

sci	en	tist	_____
use	take		_____
mis	ful		_____
al	bon		_____
be	solve		_____
worth	er		_____
shak	less		_____
sim	ist		_____
car	get		_____
chem	tween		_____
dis	i	my	_____
nug		lar	_____