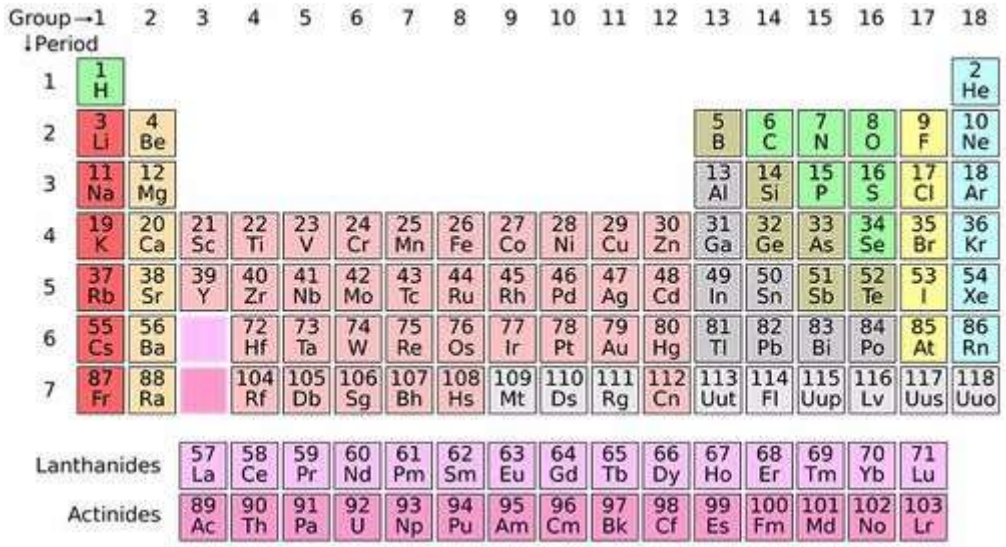
Everyday Compound or Poison?

by ReadWorks



periodic table

All elements found on the periodic table have certain distinct properties. Elements are single types of atoms, while atoms are the fundamental building blocks of all matter. Gold, for instance, is a soft, naturally occurring metal known for being beautiful and desired. Gold is malleable, and while it is found naturally in the environment, it is often reworked and incorporated into fine jewelry. Oxygen is a necessary and naturally occurring element. It's an invisible, odorless gas that's a crucial part of the air we breathe and necessary for our bodies to function properly. Often, elements like those noted are combined in varying ways to create new chemical substances.

Chemical substances react in certain ways and also have certain discernible properties. For instance, when an oxygen atom and two hydrogen atoms come together they form water, which is essential to life. When the atoms of a specific substance are regrouped, a new substance is formed with often vastly different properties from the original substance. Occasionally something completely harmless, or even necessary, can become dangerous or lethal when its molecules (a grouping of two or more atoms) are regrouped.

The components of table salt are a good example of how different substances can look when their atoms are rearranged. Common table salt, also known as sodium chloride, is an interesting chemical compound because, while it is commonly consumed by humans, when you separate its elements-sodium and chlorine-you are left with something quite different from the edible seasoning known as salt.

The components of salt are sodium and chlorine, both of which are harmful for human consumption and even contact. Sodium requires great care when being handled. If it comes into contact with water, the reaction can be flammable, while powdered sodium has the potential to be combustible (explosive) in oxygen or air.

Chlorine, meanwhile, is an extremely caustic and dangerous substance. Chlorine is used primarily as a cleaning agent; it is commonly used in swimming pools to render them sanitary, but is mixed with other chemicals and diluted for these purposes. This is what makes it safe for people to swim in swimming pools.

Chlorine has also had other, more dangerous uses in the past. Chlorine is a toxic gas that is extremely harmful to the respiratory system and may also react with certain flammable materials. When chlorine reacts with the mucous of the lungs, it can create a potentially lethal compound known as hydrochloric acid. During World War I, chlorine gas was used by Germany as a chemical weapon. It only takes a few deep breaths of the gas, at a certain potency, to cause death.

Hydrochloric acid, a clear solution of hydrogen and chlorine in water, has other uses, however, including household cleaning and food processing. It's also found naturally in the body's gastric acid. Hydrochloric acid is found in food-grade purification levels in products such as aspartame, fructose and citric acid, as well as in gelatin production.

Another, perhaps more familiar, example of atoms being regrouped to form a different compound is carbon monoxide and carbon dioxide. These gases are mentioned often and frequently mistaken for one another, but each serves very different purposes. The scientific difference between the two compounds is the number of oxygen atoms bonded with the carbon atom. But the general difference-the one we notice as humans-is quite significant.

Both carbon monoxide and carbon dioxide are colorless, odorless gases. Carbon monoxide occurs naturally in animal metabolism, plant photosynthesis, volcano eruption, forest fires and other combustion. It also comes from manmade processes like operating a stove. When carbon monoxide accumulates in a contained area, it can become lethal to humans. People who directly inhale enough carbon monoxide will lose consciousness and eventually die.

Carbon dioxide, on the other hand, occurs naturally in the atmosphere. One way carbon dioxide is produced is through the breathing processes of humans and animals. Carbon dioxide is also emitted in the burning of fossil fuels. Additionally, carbon dioxide can be found in lakes and at the bottom of the ocean.

While carbon dioxide occurs naturally and is not known to be as harmful as carbon monoxide, it can still be dangerous to humans when inhaled in certain quantities.

Slight chemical changes can radically modify the characteristics of a compound, and we don't have to look to radically different elements to find enormous differences. Sometimes only a small difference in chemical composition results in a very important alteration.

component com · po · nent

Advanced Definition

noun

1. a part or element of a whole; constituent.

   One of the engine's components is damaged.

   Vegetables are an important component of a healthy diet.

adjective

1. acting as a component; belonging to; composing.

   the component parts of an airplane engine.

Spanish cognate

componente: The Spanish word *componente* means component.

These are some examples of how the word or forms of the word are used:

1. We all know that technological progress is not an actual magic show. Still, it almost seems like magic the way the transistor, the main component in all modern electronics, has diminished in size since being invented in 1947.
2. Atoms are made up of even smaller component structures. Again, there's no way for us to observe these structures physically. That's what sets them apart from the physical properties of matter, which, as we know, are discernible to our five senses.
3. Remember, in the 1960s, computers were the size of entire rooms, and extremely expensive to use; not quite the same as the smart phone that fits in the palm of your hand. Back then, $500,000 would buy you about four computer work stations and a mainframe that could design you a few small components for a vehicle.
4. "Protein, [such as] lean meat and low-fat dairy, really helps with muscle building and recovery, so for athletes looking to gain muscle mass, that's a big component," Langford says. "You really don't get the full benefit of your training if you're not having that recovery nutrition." a peanut butter and jelly sandwich or chicken breast with veggies are both great options after a workout.
5. NPC is a cancer that grows in the nasopharynx, the uppermost region of the throat, where the nasal cavities open into it. In the United States, NPC is relatively rare, occurring in just seven of every 1 million Americans. NPC has a strong genetic component, explains Costantino, which is why the cancer is more common in Southeast Asia and among immigrant families from that region.
6. Also at the Johnson Space Center is an enormous building where astronauts train before heading to the ISS. The building houses models of the various components that make up the huge space station. There were two Russian cosmonauts walking around during the tour.

regroup re · group

Advanced Definition

transitive verb & intransitive verb

1. to form into a group or groups again.
2. to assemble again or reorganize, as military forces after a battle.

These are some examples of how the word or forms of the word are used:

1. When the atoms of a specific substance are regrouped, a new substance is formed with often vastly different properties from the original substance. Occasionally something completely harmless, or even necessary, can become dangerous or lethal when its molecules (a grouping of two or more atoms) are regrouped.
2. They scattered in all directions when they saw the car approach, and they regrouped as soon as it passed, talking excitedly, waving their arms. Men and women on bicycles waved as Xiufen and her dad passed.

substance sub · stance

Definition

noun

1. a particular kind of matter or material.

   She was covered with a sticky substance.

Advanced Definition

noun

1. that of which something is made; matter.
2. a specific kind of matter.

   a liquid substance

3. essence; meaning; gist.
4. density; body.

   a sauce with no substance

5. that which is solid, actual, or real in character.
6. wealth.

   a family of substance

Spanish cognate

sustancia: The Spanish word *sustancia* means substance.

These are some examples of how the word or forms of the word are used:

1. Do you know how to change the properties, structure and state of matter of a substance? If you have
2. When coal burns, it gives off a lot of darkcolored smoke. Soot is a black substance that is collected on a surface that comes into contact with smoke.
3. Reducing global drug violence depends on reducing demand for illegal substances, Mineta says. The United States is the world's biggest consumer of illegal drugs. And teens do their fair share of drug use: According to Students Against Destructive Decisions, half of all American teens try an illicit drug by the time they finish high school.
4. In humans, diet is strongly linked to heart disease. Eating foods high in saturated fat can cause cholesterol to build to dangerous levels in the body. Cholesterol is a soft, waxy substance the body needs in moderate amounts to build and repair cells. When cholesterol levels are too high, blockages can form in the arteries, the blood vessels that carry blood away from the heart.

5. The reef may look like a rock but it's actually alive. Coral reefs are underwater structures that are made by corals-tiny animals that are related to jellyfish. The coral have tender bodies that are vulnerable to attack, so they secrete a hard substance called calcium carbonate to protect their exteriors. The calcium carbonate builds up until it makes formations that look like rocks to the human eye.

6. At some point in the juice-making process, all the water has been removed from the fruit. What's left behind is frozen. That new substance-the concentrate-takes up a lot less space and is easy to move from one place to another. The concentrate still has all the vitamins and minerals from the original fruit. So if you buy a carton of orange juice from concentrate, that means that water has been added back to the concentrate to make your juice.

7. A sponge-like substance, coral can be a variety of different hues-sometimes they are green, sometimes brown, sometimes even blue or pink.

8. The air was thick with smoke, dust, and dangerous toxins, or poisonous substances. Many human rescue workers wore masks, but the dogs worked without protective gear. They needed their noses free so they could sniff out victims.

9. In a person with diabetes, the body makes little or no insulin. That is a substance that the body needs to help convert glucose, a sugar in food, into energy.

10. Artificial steroids are substances, including drugs, that can help an athlete become stronger.

Name: _____ **Date:** _____

1. . What happens when the atoms of a substance are regrouped?

A. gold becomes malleable

B. the atoms break apart and disappear

C. a new substance is formed

D. the substance stays the same

2. The creation of carbon monoxide is an effect. What is one cause?

A. the regrouping of the atoms in table salt

B. the burning of fossil fuels

C. cleaning swimming pools

D. operating a stove

3. Table salt can be separated into sodium and chlorine. Sodium is explosive. Chlorine is a gas that can kill people.

What can be concluded from the statements above?

A. A harmful compound can become harmless when its elements are separated.

B. A harmless compound can become harmful when its elements are separated.

C. Breaking a compound into its separate elements has no noticeable effects.

D. Breaking a compound into its separate elements can create carbon dioxide.

4. Based on the information in the passage, what is true of gases?

A. Some, but not all, gases are harmful to humans.

B. Any gas with carbon in it is not harmful to humans.

C. All gases are harmful to humans.

D. No gases are harmful to humans.

5. What is this passage mainly about?

A. Germany's use of chlorine in World War I as a chemical weapon

B. hydrochloric acid, aspartame, fructose, citric acid, and gelatin production

C. the similarities and differences between carbon dioxide and carbon monoxide

D. changes in chemical compounds and the effects of those changes

6. Read the following sentences: "When the atoms of a specific substance are regrouped, a new substance is formed with often vastly different **properties** from the original substance. Occasionally something completely harmless, or even necessary, can become dangerous or lethal when its molecules (a grouping of two or more atoms) are regrouped."

What does the word **properties** mean above?

A. extremely large amounts
B. places where experiments are done
C. qualities or characteristics
D. elements or compounds

7. Choose the answer that best completes the sentence below.

Oxygen by itself is not harmful; _____, it can become harmful when combined with carbon.

A. however
B. for instance
C. in summary
D. namely

8. What is hydrochloric acid?

9. What is hydrochloric acid used for?

10. Should people make changes to chemical compounds? Support your answer with evidence from the passage.

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8. What is hydrochloric acid?

Hydrochloric acid is a solution of hydrogen and chlorine in water.

9. What is hydrochloric acid used for?

Hydrochloric acid is used for household cleaning and food processing.

10. Should people make changes to chemical compounds? Support your answer with evidence from the passage.

Answers may vary, as long as they are supported by the passage. Students arguing that people should not make changes to chemical compounds may point out the dangers of doing so. For example, breaking salt into its component elements, sodium and chlorine, creates two harmful substances. On the other hand, students may argue that combining elements can be helpful. One example is hydrochloric acid, a combination of hydrogen, chlorine, and water that is used for household cleaning and food processing.