

As you delve deeper into the science of chemistry, you will learn more and more about matter. You'll learn more about the different elements that make up the periodic table. You'll learn how different atoms can join to form different molecules.

Recall that **physical properties** describe a substance. Physical properties include color, density, odor, and changes between states of matter. A substance also has **chemical properties**, which describe how it interacts with other substances. Chemical properties can help you identify an unknown substance. They can also help you predict how substances will interact. Remember that some qualities, like mass and volume, are not considered properties of matter. That's because those qualities change depending on the amount of the substance. All properties of matter stay the same and do not depend on the size of the sample.

There are many kinds of chemical properties. Some of them include acidity, combustibility, and reactivity.

Acidity and basicity

Acids are liquids that have few hydroxide (OH^-) ions. Because of their chemical properties, acids interact in certain ways with other substances they touch. Acid rain is caused when chemicals in the air react with water, forming acid that can damage plants and corrode metal. Other acids exist in the foods we eat and the household chemicals we use.

Liquids that have many hydroxide ions interact with other substances very differently from acids. We call these substance **bases**. Bases are often found in soaps and lubricants.

We use the pH scale to measure the **acidity** or **basicity** of a liquid. The pH scale ranges from 0 to 14. Substances that measure 7 on the scale are neutral. Distilled water is neutral; it's neither an acid nor a base. Basic liquids can have a pH of between 7 and 14. Acids are substances that have a pH of between 0 and 7.



Chemical properties can be observed when a substance undergoes a chemical change.

Combustibility

Combustibility is the chemical property of a substance that describes its ability to ignite and burn. Working with combustible substances can be very dangerous. Do not try to ignite anything without your teacher's permission and instruction.

When combustion occurs, heat is usually generated. You've seen this if you've ever built a campfire or barbecued food over hot coals. The combustion creates heat. Some substances are more combustible than others. In general, substances that contain the element carbon are very combustible. Some gases, like hydrogen, are also very combustible.

Reactivity

Some substances react violently with other substances. For example, if you add vinegar to baking soda, the reaction creates a sort of mini-eruption. Other chemical reactions happen very slowly, like when a metal building slowly rusts over time. Other substances are inert, or chemically inactive. These inert substances do not react with other substances.

During a chemical reaction, some molecules are broken down into atoms. The atoms then combine in predictable ways to form new molecules. That is why new substances can be formed by a chemical reaction.

Chemical reactions happen at different rates, depending mostly on the substances involved. There are a few ways we can influence the rate of a reaction, however. These include controlling the concentration, the temperature, or the pressure of the substances. Higher concentrations mean that more molecules of a substance are present to fuel the reaction. Increasing temperature or pressure increases the movement of atoms. The faster atoms are moving, the more quickly they will collide with other atoms and form new molecules. Decreasing the temperature or pressure usually decreases the rate of reaction.



Combustibility refers to the ability of a substance to ignite and burn.