

# Classroom Chemistry

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When you imagine a scientist, who do you picture? What is your scientist wearing? Where are they working? Are they using any special equipment? For most people, the first scientist who comes to mind is often a chemist, someone who practices chemistry. **Chemistry** is the science of mixing things and understanding the properties of matter.

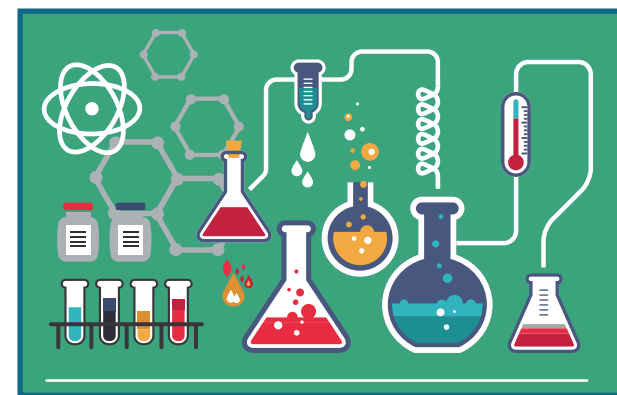
**Matter** is the “stuff” that makes up everything around us. It’s made of atoms that are the building blocks of all things. An **atom** is the smallest piece of matter that has the characteristics of a specific type of substance, which we call an **element**.

When chemists study the properties of matter, they study what kinds of elements and atoms are involved in substances to help them identify what they are like and predict how they will behave in certain circumstances. By mixing different substances together, sometimes chemists can create new substances by changing the way that the atoms interact with one another.

Many elements have atoms that like to group together with other atoms, sometimes with the same type and sometimes with specific other types. Some elements have atoms that can bond with many different types of other elements, or in many different combinations. We can study the matter that these groupings create in a variety of ways. One of the ways we can understand matter is by what phase it is in, or what **state of matter**, such as being a solid, a liquid, or a gas.

The atoms in a solid group together tightly, and vibrate constantly, while the atoms in a liquid are grouped more loosely. This gives solids their ability to keep their shape, while liquids flow and change to the shape of their container. The atoms in a gas are in constant motion, expanding to fill all available space.

Sometimes, when matter mixes together, a **chemical reaction** takes place. The ingredients used to cause the reaction mix together and change into new ingredients. This is different from a phase change, where the same ingredient is just shifting between solid, liquid, and gas, but sometimes we can phase changes alongside chemical changes.



## Closed-System Experiment



For this experiment, you will need a balloon filled with a few spoonfuls of baking soda and a bottle filled with a few fluid ounces of vinegar. When you are ready to complete the experiment, take the opening of the balloon and carefully slide it onto the mouth of the bottle. Be careful not to lift the balloon so the baking soda falls into the bottle just yet!

Observe what states of matter you see within the closed system you’ve created. It’s a closed system because once the balloon is sealed onto the bottle, anything that changes inside either container is going to be caused by a reaction inside the set—nothing new can get in, and nothing created can get out.

After you make your first set of observations, lift the end of the balloon so that the baking soda falls into the bottle and mixes with the vinegar. What do you see? What do you hear?

When the reaction stops, observe the states of matter you have in the closed system now. Is it the same set you started with in the same amounts and places? Do the ingredients seem to be the same as they were at the start? Is there any evidence that tells you something new has been created in a chemical change?

Write a paragraph explaining whether or not you think that mixing the two substances has created any new substances. Be sure to explain why or why not using evidence from your observations of the experiment.

