



Understanding Physical Properties of Matter

Science is divided into many different topics. You have probably been learning the basics about scientific investigations since elementary school. Your teacher has likely been working with you to understand lab safety as well. Lab safety includes handling chemicals safely and protecting your eyes and hands. But what have you learned about the properties of matter? In chemistry, it's important to understand both the physical and chemical properties of matter. Let's explore physical properties of matter in greater depth.

Many students make the common mistake of thinking that mass and volume are physical properties of matter. In fact, they're not! Mass and volume of a substance can change depending on the size of the sample. If you have a large chunk of quartz and a small particle of quartz, each sample will have a different mass and volume. Both samples are still quartz, however! The same is also true of shape. Even physical state isn't considered a physical property. That's because some substances, like water, can change states—ice, water vapor, and liquid water are different states of the same substance.

Scientists have identified many different physical properties. In this passage, we'll explore the physical properties of color, density, solubility, melting point, boiling point, and conductivity.

Color

Color is a physical property that you're likely to notice right away. Some substances have specific colors that help us identify them. For example, most plants are green because they contain a pigment called *chlorophyll*. Other substances appear as different colors when they're in different forms, and some substances are colorless, such as clear water.

Density

Density is a way to describe the relationship between a substance's mass and its volume. In fact, a substance's density equals its mass divided by its unit volume. If the molecules and atoms of a substance are closely packed together, the substance

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will be very dense. A certain volume of a dense substance, such as lead, will be heavier than the same volume of a less dense substance, such as cotton. Cotton molecules are spaced far apart with air between them. Therefore, cotton has a relatively low density.

Solubility

Solubility refers to how easily a substance is dissolved. We often use water to try to dissolve substances. A substance like salt or sugar is highly soluble, but a substance like mercury won't dissolve at all. A substance that doesn't dissolve at all is called *insoluble*.

Melting point and boiling point

Melting points and boiling points are two physical properties related to heat and pressure. A substance's melting point is the temperature at which it changes from a solid into a liquid. Some substances have a very low melting point and are liquid at room temperature.

Boiling point is the temperature at which a substance changes from a liquid to a gas. When you see water boiling, it's changing to a gas. If you let it boil long enough, all of the water molecules will leave the pan. The boiling point of a substance also depends on pressure. At higher elevations, there is less atmospheric pressure. As a result, water in the mountains will boil at a **lower** temperature, and thus faster, than at sea level.

Conductivity

Conductivity is the ability of a substance to conduct electricity. Some metals, like copper, conduct electricity very well. The electrical wires in your house are made of thin strands of conductive metal. Other substances, like glass, do not conduct electricity. Glass is called an insulator because it prevents electrical current from moving.

What do you think is the most important characteristic to study when learning about matter?



Cotton is an example of a substance that is not very dense.



The temperature at which ice turns to liquid is its melting point.