

Matter

Section 3: Describing Matter

All matter has both physical and chemical properties that help describe how a substance looks, behaves, or changes. These properties allow scientists to identify and classify different kinds of matter.

UNDERSTANDING MATTER

KEY DIFFERENCES

PHYSICAL PROPERTY	CHEMICAL PROPERTY
<p>A characteristic of a substance that can be observed or measured WITHOUT changing its identity.</p> <p>KEY POINTS</p> <ul style="list-style-type: none">Can be observed or measured without changing the substance into something new.Example: color, density, melting point. <p>EXAMPLES</p> <p>Color (gold) Density (1.0 g/ml) Melting Point (0°C for ice)</p> <p>Example: The color of copper is reddish-brown.</p>	<p>A characteristic of a substance that describes its ability to undergo a chemical change and form new substances.</p> <p>KEY POINTS</p> <ul style="list-style-type: none">Can only be observed when a substance changes into a new substance.Example: flammability, reactivity, toxicity. <p>EXAMPLES</p> <p>Flammability (burns in air) Reactivity (reacts with acid) Toxicity (poisonous)</p> <p>Example: Iron reacts with oxygen to form rust.</p>
PHYSICAL CHANGE	CHEMICAL CHANGE
<p>A change in matter that does NOT change the chemical identity of the substance.</p> <p>KEY POINTS</p> <ul style="list-style-type: none">No new substance is formed.Usually reversible.Only size, shape, or state changes. <p>EXAMPLES</p> <p>Melting Ice Tearing Paper Boiling Water</p> <p>Example: Ice melting into liquid water.</p>	<p>A change in matter that DOES change the chemical identity of the substance.</p> <p>KEY POINTS</p> <ul style="list-style-type: none">One or more new substances are formed.Usually not reversible.Often involves energy change (heat, light, etc.). <p>EXAMPLES</p> <p>Burning Wood Rusting Iron Vinegar + Baking Soda</p> <p>Example: Burning wood to produce ash and gases.</p>

A **physical property** is a characteristic that can be observed or measured without changing the substance's identity. For example, tearing or crumpling a piece of paper changes only its shape, not what it is made of. The paper is still paper after these changes occur. Physical properties include characteristics such as color, hardness, density, and boiling and melting points.

In contrast, a **chemical property** describes a substance's ability to change into a new kind of matter. When a chemical change occurs, the original substance is transformed into one or more new substances with different properties. For example, if you burn a piece of paper, it turns into ash and gases that are different from the original paper. This ability to burn is called **flammability**, which is a chemical property. Other chemical properties include combustibility, acidity, and rust resistance.

A **physical change** is a change in the size, shape, or state of matter without changing the substance's identity. Even though the substance's appearance may change, the material itself remains the same. For example, when water freezes, it changes from a liquid into a solid, but it is still water. Its composition has not changed. Physical changes are often reversible. If heat is added to an ice cube, it melts and changes back into liquid water.

In contrast, a **chemical change** occurs when one substance changes into a completely different substance with new properties. During a chemical change, the starting substances, called **reactants**, are transformed into new substances called **products**. A firework explosion is an example of a chemical change because the chemicals inside the firework react to form new substances while releasing light, sound, and heat. Although the substances change during a chemical reaction, the total amount of matter remains the same. This idea is explained by the **law of conservation of mass**,

Matter

Section 3: Describing Matter Cont.

which states that mass is neither created nor destroyed during a chemical change. In other words, the total mass of the reactants before the reaction is equal to the total mass of the products after the reaction.

Review:

1. Explain the difference between a physical property and a physical change.
2. Give one example of a chemical change.
3. What is the law of conservation of mass?