



Changes in Matter

Physical and Chemical Change

Unit 3 - Lesson 1

Physical and Chemical Change

Students will be able to:

- Know about different changes occurring in matter.
- Differentiate between physical changes and chemical changes in matter.

Core Vocabulary:

Reactants, products, combustion, chemical bond, rusting,
sublimation

Physical and Chemical Change

Many changes occur in our surroundings in matter. We can broadly classify them into two types of changes, physical change and chemical change.

Physical and Chemical Change

Chemical Change

- Chemical changes are the changes that cause chemical bonds to break in a substance. In simple words, chemical changes are also called chemical reactions.
- Chemical changes occur when two different substances react with each other to form a new substance. The ingredients of a reaction are called reactants and the new substances are called products.

Physical and Chemical Change

Examples of Chemical Changes:

1. **Cooking food:** When food is cooked many chemical bonds are broken. For example, when cooking an egg, the properties of egg change and the translucent egg white becomes opaque.



A Frying Egg

Physical and Chemical Change

2. **Rotting of a substance:** When fruit, bread or cooked food becomes rotten, various chemical bonds are broken that lead to the degradation of that substance.



A ripe Apple



A Rotten Apple

Physical and Chemical Change

- 3. Rusting of iron:** When an iron nail is exposed to air/oxygen, it is oxidized and changes its color to reddish orange, known as rust. Rusting of iron is a chemical change.



A Rusted Chain

Physical and Chemical Change

4. **Burning a candle:** When a candle burns, carbon dioxide and water molecules are released.



A Burning Candle

Physical and Chemical Change

- 5. Change in the color of a substance:** When two transparent liquids are mixed and a colored product is formed, it is considered a chemical change because a new substance is formed by the reaction between two substances.
- 6. Combustion:** Burning of gases, fuels, wood and charcoal are examples of combustion process where soot, carbon dioxide and water are released.

Burning Flame



Physical and Chemical Change

Properties of Chemical Change

1. Chemical changes are irreversible.
2. Chemical changes lead to changes in color, temperature and smell of the substance.
3. New substances are formed during a chemical change.
4. Chemical changes may lead to light and sound production, release of gases and heat.

Physical and Chemical Change

Physical Change

- Physical changes are those changes where a chemical bond is not broken. In other words, during a physical change, the appearance of a substance changes and not the chemical composition.
- Thus, the substance remains the same but the appearance changes.

A Physical Change occurs:

- During phase change of a substance
- During cutting, mixing and grinding of a substance
- During separation of two substances from a mixture

Physical and Chemical Change

Physical changes occur when:

1. changes in the state (phase) of a substance takes place such as boiling, melting, freezing, condensing, deposition and sublimation. It is also explained as changes in the state of matter such as solid changing to liquid state and liquid changing to gaseous state.
2. cutting, grinding, mixing, blending and tearing occurs.
3. separating ingredients from a mixture. This is seen during distillation, crystallization and filtration. Two or more mixtures can be separated from each other without changing the chemical properties of each substance.

Physical and Chemical Change

Examples of Physical Changes:

- 1. Preparation of a smoothie or a shake:** When a smoothie or a shake is prepared in a blender, the chemical properties of the fruits and milk remains intact.
- 2. Cutting of wood or chopping fruits and vegetables:** In these processes, the chemical composition of the fruits and vegetables remain the same.

Physical and Chemical Change

- 3. Boiling of water:** When water boils, no chemical bonds are broken, thus it is a physical change. Only the state of the water is changed from liquid state to vapor (gas) state. This is a reversible process, as condensation of water vapor can lead to the formation of water.



Boiling of Water

Physical and Chemical Change

4. **Melting of ice:** Solid form of water (ice) can be converted into liquid without changing the chemical composition of ice. It is a physical change and reversible.



Melting of Ice

Properties of Physical Change:

- No chemical bonds are broken.
- No new substances are formed.
- The original properties of the matter remain unchanged.
- The chemical composition of substance is not changed.
- Only the state and properties of a substance is changed in a physical change.
- Physical change can be reversed.

Physical and Chemical Change

Practice Problems:

Label the following as Physical change or Chemical change:

- Boiling of egg:
- Melting of Copper:
- Breaking of mirror:

Physical and Chemical Change

Practice Problems: Answers

Label the following as Physical change or Chemical change:

- Boiling of egg: **Chemical change**
- Melting of Copper: **Physical change**
- Breaking of mirror: **Physical change**