Physical & Chemical Changes

7.P.2B.4 Plan and conduct controlled scientific investigations to answer questions about how physical and chemical changes affect the properties of different substances.

What You Are Expected To Know

Physical properties- can be observed and measured without changing the kind of matter being studied

Chemical properties- can be recognized only when substances react or do not react chemically with one another, that is, when they undergo a change in composition

Vocabulary terms:

physical change

a change that alter the physical properties of a substance without changing the composition of the substance.

state of matter

the physical form in which matter exists-solid, liquid, & gas

chemical change

a change in matter that results in the formation of one or more new substances that have new chemical AND physical properties

precipitate

a solid substance that forms when two solutions are combined

Physical changes do not change the composition of a substance, only the physical properties

Evidences of physical changes:

- Change in the state of matter
- Change in size or shape

Changes in State of Matter

- When a substance changes from one state of matter to another, the composition of the substance remains the same
  - for example, changing from solid to liquid, from liquid to solid, or from liquid to gas
- Examples of change in state might include:
  - melting of ice cream, hardening of melted wax, or evaporating of water from wet clothes.

Changes in Size or Shape

- When a substance changes in size or shape When a substance changes in size or shape, its composition remains the same.
  - for example, cutting, tearing, dissolving, stretching, or wrinkling
- Examples of change in size or shape might include:
  - shredding paper, dissolving sugar in water, stretching a rubber band, wadding up a piece of paper, or denting a piece of metal.

Chemical changes result in the formation of one or more new substances with new chemical and physical properties.

Evidences of chemical changes:

- Color change
- Temperature change
- Formation of a precipitate
- Formation of a gas

Color Change

- When a substance changes color, the chemical composition of the substance may have changed
  - iron turns to a reddish-brown when it rusts
  - clothes change color when bleach is added
  - apples turn brown when they react with oxygen in the air
  - marshmallows turn black when burned
- It is possible to have a color change without a chemical change
  - adding food coloring to water

Temperature Change

- When a substance is combined with another substance, there may be an increase or decrease in temperature
  - when wood burns to ash and gases, the temperature increases
- It is possible to have a temperature change without a chemical change usually due to a heat source
  - warming of the water in a pot

Formation of a Precipitate

- When two solutions are combined, they may form a new solid substance. This solid substance is called a precipitate and indicates that a chemical change has occurred.
  - when carbon dioxide is combined with aqueous calcium hydroxide (limewater), solid calcium carbonate (chalk) is formed
- The precipitate may be in the form of very small particles, appearing as cloudiness in the solution or as a solid which settles to the bottom of the container.

Formation of a Gas

- When solid or liquid substances are combined, they may form gas bubbles or smoke indicating that a chemical reaction has taken place.
  - when vinegar is added to baking soda, it forms carbon dioxide bubbles
- It is possible to form gas without a chemical change
  - water is heated to boiling