

2. Physical and Chemical Changes

Learning Objective

1. Introduction
 2. Physical Changes
 3. Characteristics of physical changes
 4. Chemical changes
 5. Characteristics of chemical changes
 6. Changes involving energy
 - 6.1 Energy changes in physical change
 - 6.2 Energy changes in chemical change
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1. Introduction

- In chemistry, changes that substance undergo are mainly of two types: Physical change and chemical change.
- You can observe various substance undergoing one type of change to other the world is continuously changing.

2. Physical change

- A physical change is a change in which no new substance is formed, the chemical composition of the original substance is not altered.
- In physical change certain physical properties such as state color and shape may change.
- Example, dissolving of common salt in water is a physical change.
- Some examples of physical changes are: - melting of wax, Magnetization of iron, sublimation of iodine, evaporation of water, freezing of water, tearing of paper, precipitation in form of rain and snow, breaking a piece of chalk, stretching a rubber band, etc.

NOTE: -

- All changes in our physical change that is melting (fusion), freezing (solidification), boiling (vaporization) and condensation.

3. Characteristics of physical changes

1. The change is temporary and can be reversed by changing the conditions.
2. No new substances form so, there is no change in the mass of the substance undergoing a physical change.
3. There is no change in chemical composition of the original substance.
4. There may or may not be a change in physical properties such as state shape size or color of the original substance.
5. No significant change in energy is involved.

4. Chemical changes

- A chemical changes a permanent change in which the original substance loses its own composition and properties.
- Due to this, one or more new substances with a different composition and properties is formed.
- The change is permanent and cannot be reversed
- Example, if you burn a piece of paper a new substance such as carbon dioxide water vapor smoke and acid is produced.
- Some examples of chemical change are: - digestion of food, reaping of fruits, burning of a candle, rotting of rotting of egg, fragmentation, rusting of iron, burning of piece of magnesium ribbon in air, etc.

NOTE: -

- Some chemical changes required the presence of another substance that does not undergo any change. such a substance is called catalyst. Chlorophyll in plant is a catalyst. It helps to change the water and carbon dioxide to food and oxygen in the presence of sunlight but does not get changed.

5. Characteristics of chemical changes

1. One or more new substances formed composition and properties different from the original substance.
2. The change is permanent and irreversible.
3. An energy change is generally involved in a chemical change. Energy is neither absorbed or nor evolved during the chemical change.
4. The mass of the substance undergoing the chemical change is generally altered.
5. It may be noted that total mass of the substance involved in chemical change remains the same hence mass can neither be created nor be disappointed during any chemical change this is called conservation of mass.

NOTE: -

- When a chemical change takes place with the absorption of heat energy, the change is said to be endothermic.

- When change takes place in evolution of heat energy, the change is said to be exothermic.

Physical Change	VS	Chemical Change
(Only state changes)		(New substances formed)
Physical Change - No new substance is formed. Only physical properties like shape, size, or state may change. - Temporary and reversible. - No change in the mass of the substance undergoing the change. - No significant energy change involved.		Chemical Change - One or more new substances with different properties and composition are formed. - Permanent and usually irreversible. - Mass of the reacting substances may change, but total mass remains constant. - Energy is absorbed or released during the reaction.

6. Changes involving energy

- During any change, generally evolution or absorption in form of heat light sound or any other form.
- Energy change may take place when there is physical change.
- these changes are generally smaller than the energy change takes place during a chemical change.

6.1. Energy changes in a physical change

- During any physical change, two types of process occur often namely, change in, dissolving of a substance in liquid.
- Both the process involves energy change mainly a change in heat energy.
- A change of state from solid to liquid, from liquid to gas the intermolecular force of attraction between the molecule has to be decreased so that the intermolecular space increases this is possible only when the solid or the liquid absorb some heat energy.
- A change of state from liquid to solid or from Gas to liquid, the intermolecular force of attraction between the molecule has to increase so that the intermolecular space decreases this happens when the liquid or the gas release some heat energy.
- The absorption or evolution of heat energy is also observed when a substance is dissolved in a liquid.

6.2. Energy changes in a chemical change

- In a chemical change of substance, the molecule of atom of the substance rearranges themselves to form a new substance.
 - This rearrangement involves some energy changes energy is released in some chemical change while in other it is absorbed.
 - Energy is in in the form of heat or light is released in chemical change.
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