

7th – Physical and Chemical Changes I



Properties such as shape, size, color and state of a substance are called its physical properties.

Physical Changes: Physical changes are the changes in which no new substance is formed. E.g. the formation of ice from water is a physical change. **Physical changes** are most of the times for a short span of time, better we can say these changes are temporary and can be reversed. Hence physical change can be defined as: A physical change is the one that changes the shape, size, physical state or appearance of substance but not its chemical composition

Characteristics of a physical change:

1. The change is reversible and temporary
2. No new substance is formed
3. No loss or gain of energy takes place during a physical change
4. No change in mass occurs during a physical change

Example of physical change:

- 1) Formation of dew
- 2) Breaking of glass
- 3) Sublimation of iodine
- 4) Melting of wax
- 5) Beating aluminum to make aluminum foil
- 6) Drying of wet clothes
- 7) Bending of glass tube
- 8) Crushing of iron
- 9) Crystallization of sugar
- 10) Cutting of nails

Chemical Change: A chemical change occurs when two or more chemical substances react to produce new substance with a different set of properties. It is permanent which cannot be reversed. Examples:

1. Reddish - Brown Decomposition on Iron Objects: Iron reacts with atmospheric oxygen in the presence of moisture to form a reddish-brown layer of iron oxide. This layer is called rust and process is called rusting.

Oxygen and water are the two essential conditions for rusting of iron.

Oiling and painting of iron objects protect their surfaces from coming in contact with moisture and air and prevent rusting.

2. Browning of Vegetables and Fruit Surfaces: When we exposed the cut surface of a brinjal to the air for some time, the surface has turned brown, due to a chemical reaction between certain compounds present in brinjal and atmospheric oxygen to produce a brown colour pigment "melanin" that cause browning of the surface. Cut vegetables and fruits soaked in water can reduce the level of browning because water restrict the amount of oxygen to come in contact with surface of cut vegetables and fruits.

3. Reaction Between Vinegar and Baking Soda:

Vinegar + Baking soda \longrightarrow carbon dioxide + water + other substances

To test carbon dioxide gas,

Carbon dioxide + lime water (calcium hydroxide) \longrightarrow calcium carbonate + water

4. Reaction Between Copper Sulphate Solution and Iron Filings:

Copper sulphate + Iron \longrightarrow iron sulphate + copper

Characteristics of chemical change:

1. The chemical change is irreversible and permanent
2. The composition of a substance changes during a chemical change
3. Either heat is absorbed or evolved during a chemical change
4. Total mass of the system remains same

Example of chemical change:



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1. Rusting of iron
2. Digestion of food
3. Decomposition of water
4. Butter turning rancid
5. Drying of paint
6. Clotting of blood.
7. Digestion of food.
8. Photosynthesis
- 9) Burning of candle
- 10) Burning of food
- 11) Curdling of milk
- 12) Ripening of fruit
- 13) Change in color of an apple cut into halves
- 14) Changes in color of brinjal slice.
- 15) Acid base neutralization reaction.
- 16) Removing cream from milk.

Difference Between Physical & Chemical Change

Physical changes	Chemical changes
A physical change is temporary	A chemical change is permanent.
A physical change can be reserved.	chemical change is irreversible
No new substances are formed during a physical changes	New substances are formed during a chemical change
No changes in energy take place.	Energy is either absorbed or evolved.
Composition of a substance remains same.	Composition of a substance change during the chemical reaction.

Chemical Substances: Chemical substances are made of atoms and molecules. An atom is the smallest particle of a substance and it may or may not exist independently. Molecules are formed when two or more atoms join together and it can exit independently.

Elements: an element is a substance that is made up of only one kind of atoms and cannot be broken down into simpler substances by chemical means. E.g.- silver, gold, hydrogen, oxygen and has distinct set of properties.

Compounds: A compounds is a substance that is formed when two or more elements combine chemically. Molecule is the smallest particle of the compound. the properties of compounds are entirely different from those of its constituent elements. E.g. water

Mixture: Mixtures consist of two or more substances simply mixed together, but not chemically combined. E.g. air. Mixture retain the properties of its components.

Chemical symbols: the abbreviations used to represent elements are called chemical symbols. Sir Johan Dalton created his own set of pictorial symbols for elements. The modern system of representation was given by Jons Jacob Berzelius. Instead of pictures he made use of the English alphabets to represent various elements.

Element	Symbol	Element	Symbol	Element	Symbol	Element	Symbol
Fluorine	F	Silicon	Si	Potassium	K	Iodine	I
Barium	Ba	Gold	Au	Aluminium	Al	Helium	He
Boron	B	Silver	Ag	Mercury	Hg	Lithium	Li
Neon	Ne	Lead	Pb	Sodium	Na	Nickel	Ni
Cobalt	Co	Iron	Fe	Sulphur	S	Copper	Cu
Calcium	Ca	Chlorine	Cl	Phosphorus	P	Hydrogen	H
Oxygen	O	nitrogen	N	Magnesium	Mg	Zinc	Zn

Atomicity: the numbers of atoms present in one molecule of an element is known as its atomicity. Molecules can be:



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Atomicity	Types of molecules	Examples
1	Mono atomic	He, Ne, Na, K
2	Diatomic	H ₂ , N ₂ , O ₂
4	Tetra atomic	P ₄

Chemical formulae: the representation of a molecule of a compound using chemical symbols of its constituent elements is called a chemical formula.

Name	Formula	Name	Formula
Water	H ₂ O	Calcium carbonate	CaCO ₃
Sodium chloride	NaCl	Nitric acid	HNO ₃
Hydrochloric acid	HCl	Sulphuric acid	H ₂ SO ₄

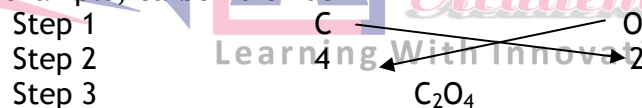
Valency: the combining capacity of the atom of an element is called valency.

Elements	Valency	Elements	Valency
Hydrogen	1	Sodium	1
Carbon	4	Magnesium	2
Oxygen	2	Calcium	2
Chlorine	1	Copper	1 or 2
Potassium	1	Nitrogen	3 or 5
Iron	2 or 3	Aluminium	3
Sodium	1	Zinc	2

Steps for writing a chemical formula:

1. Write down the symbols of the constituent elements.
2. Write down the valencies of the elements.
3. Cross over the valencies and write them as subscript.
4. If the valency is divisible by a common number, then divide and simplify the formula.

For example, carbon dioxide



the valences are divisible by two, so the chemical formula is CO₂