

CHAPTER TWO

PHYSICAL AND CHEMICAL CHANGES,

MIXTURES AND COMPOUNDS.

Physical Change:

- This is a change in which no new substance is formed..
- For example when solid sulphur is heated, it only melts into the molten or the liquid state.s- In this case no new substance is formed, since the solid sulphur and the molten sulphur are all sulphur.
- Another example of physical change is the changing of liquid water into ice, which is water in the solid state.
- In short the ice and liquid water are the same, for the ice can easily be converted back into water when it is allowed to melt.

Characteristics of physical change:

- (1) In physical change no new substance is formed.
 - For example a physical change such as the conversion of ice into water, produces no new substance since the ice and the water are the same.
 - (2) Physical changes are easily reversible.
 - For example if liquid water is converted into ice, the ice can easily be converted back into liquid water by allowing it to melt.
 - (3) Physical change does not result in any change in weight.
- For example if a quantity of water is first weighed before it is converted into ice, it will be noticed that the weight of the water and the ice will be the same.

Examples of physical changes:

- (1) The melting of solids into liquids.
- (2) The solidification of liquids into solids.
- (3) Vaporization of liquid into vapour.
- (4) Condensation of vapour into liquid.
- (5) The magnetization of iron.
- (6) The heating of a metal wire by electricity.
- (7) Dissolving salt in water.

Chemical change:

- This is a kind of change in which a new substance is formed.
- For example if we burn paper, we get soot.- This is a chemical change since the soot is completely different from the paper.

Characteristics of chemical changes:

(1) Chemical changes are not easily reversible.

- For example if paper is burnt into soot, it will either be difficult or impossible to convert the soot back into paper.

(2) Chemical change always produces a new kind of substance.

- For example in the burning of paper into soot, the soot is different from the paper.

(3) Chemical change always produces a new substance, whose weight is different from that of the original substance..

- For example when paper is converted into soot, it will be noticed that the weight of the soot is not the same as that of the paper.

(4) Chemical changes are normally accompanied by great heat changes, such as explosions.- -

The rusting of iron and the burning of any material are examples of chemical changes.

The differences between physical and chemical changes:

Physical Change	Chemical Change
(1) Produces no new kind of substance or matter.	(1) Always produces a new kind of substance or matter.
(2) Produces no change in weight.	(2) Produces a change in weight.
(3) Is easily reversible.	(3) Is not easily reversible.
(4) It is not accompanied by great changes.	(4) It is accompanied by great heat changes.

(Q1) State whether the following are physical or chemical changes:

- (a) The boiling of egg for five minutes.
- (b) Chewing a piece of bread.
- (c) Chewing of piece of meat for two minutes in the mouth.
- (d) Dissolving common salt in water.
- (e) The burning of charcoal.

Soln:

- (a) This is a physical change since the egg only changes from the liquid into the solid state, without any change in its food nutrients.
- (b) It is a chemical change because a substance called ptyalin found in saliva, will break the starch within the bread into simple sugar.
- (c) This is a physical change since the meat only breaks down into pieces, but the protein it contains does not change since ptyalin has no effect on protein.
- (d) This is a physical change, since the salt does not change but only breaks down into smaller particles.
- (e) It is a chemical change because the charcoal changes into a new material.

(Q2) Determine whether the following are physical or chemical changes:

- (a) The melting of ice.
- (b) Putting HCl into NaOH.

Soln:

- (a) This is physical change since the ice only changes from the solid into the liquid state, and still remains as water.

- (b) In other words, no new substance is formed.
- (c) This is a chemical change because the HCl will combine with the NaOH to form NaCl and H₂O, which are new substances.

(Q3) Explain how you will demonstrate that

(a) a liquid has no fixed shape.

(b) a gas has no fixed volume.

Soln:

a). Containers of different shapes are taken, and liquid such as water is poured into each of them one after the other.

- It will be noticed that in each case, the liquid will take the particular shape of the container into which it is placed.

- When smoke is created at one corner of a room, it spreads to fill the whole room, which shows that a gas has no fixed volume..

Physical and Chemical Combinations:

- Elements, substances and items can either be physically or chemically combined.- An example of a physical combination is the mixing together of stones and sand.- In such a case, the stones and sand when combined together do not result in the formation of a new substance.- Within such a mixture or combination, the stones within still remain stones while the sand still remains sand.- Another example of a physical combination is the mixing together of gari and beans.- An example of a chemical combination is the combination of oxygen and hydrogen to form water.

- In such a case a new substance is formed, since the oxygen and hydrogen are completely different from the water.

MIXTURE:

- This is the physical combination of two or more substances.- Examples of mixtures are :

- (1) A combination of sand and stones.
- (2) A combination of water and alcohol.

Types of Mixtures:

- There are different types and examples are:

(1) Solid- Solid Mixture:

is formed when two or more solid particles are mixed together.
example of this type of mixture is a mixture of sand and stones.

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(2) Solid- Liquid Mixture:

This type of mixture is formed when solid particles are mixed with a liquid.

- An example of this type of mixture is a mixture of stones and water.

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(3) Solid – Gas Mixture:

-This is formed when solid particles are mixed with a gas, and an example is a mixture of dust particles and air.

(4) Liquid – Liquid Mixture: -This is had by mixing two different liquids together, and an example is a mixture of water and alcohol.

(5) Gas- gas mixture:

- This is a combination of two different gases and an example is a mixture of hydrogen and oxygen.

SEPARATION OF MIXTURES:

Method of separation includes the following :

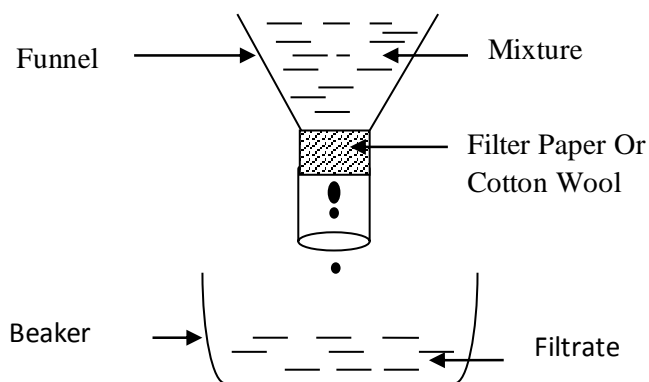
- (1) Picking.
- (2) Filtration.
- (3) Evaporation.
- (4) Distillation.
- (5) Floatation.
- (6) Sieving.
- (7) Sublimation.
- (8) Magnetic separation.
- (9) Fractional distillation.
- (10)Chromatography.

Picking:

-This method can be used to separate a mixture, in which one constituent is larger than the other.- For example a mixture of sand and stones can be separated, by picking the stones from the sand.

Magnetic separation:-This method of separation is used when one of the items or constituents of a mixture, is a magnetic material.- For example a mixture of iron filings which is a magnetic material and sand can be separated, by using a magnet to attract the iron fillings from the mixture.

Filtration:



- This method can be used to separate a mixture of a liquid, and another material which does not dissolve in the liquid.
- For example a mixture of water and clay (or clay suspension), can be separated by this method.
- The stem of the funnel is first blocked with a filter paper, or cotton wool and the clay suspension poured into the funnel.
- Even though the water within the mixture can pass through paper into the beaker, the clay particles cannot and as such will therefore be deposited on the cotton wool or the filter paper.
- The liquid obtained after the filtration process is called the filtrate.

Evaporation:-If a solid has been dissolved in a liquid such as water to form a mixture, then this method of evaporation can be used in the separation of the mixture.-For instance salt can be obtained from sea water by this method.-The sea water is placed into container and heated.-The water evaporates and the salt particles will be left within the container.

Floatation:- If the weight of one of the constituents of the mixture is far greater than that of the other, then this method can be used in their separation.- For example a mixture of pieces of paper and stones can be separated by this means.-Water is first added to the mixture, which causes the pieces of paper to float.s-The water together with the pieces of paper is then poured into another container, and the pieces of paper collected from it.