- Science & Technology

- CHEMISTRY

  - Part 2

Mixture

- A matter composed of two or more substances whose particles are in contact but are not chemically combined and have not lost their individual properties.
  Ex. A mixture of common salt and water will have different properties like density, boiling point etc. depending upon the amounts of the two components present in it.

- These properties will differ with different proportions however, the properties of water and salt are not lost or altered in the mixture

Homogenous mixture

- Homogeneous mixture have the same composition and properties throughout their mass
- Ex. Sugar solution

Heterogeneous mixture

- Heterogeneous mixture have the different compositions and properties in different parts of their mass.
  Ex. Sand mixed with Salt, Atmospheric Air, Sea water

Solution

- A homogeneous mixture of two or more substances chemically non-reacting whose composition can be varied is called a solution.
- The substances which make up the solution are called components.

  Solvent is the substance in which solute is to be dissolved.

  Solute is the substance to be dissolved in a solvent.
- Solvent + Solute = Solution.

  If the two substances are in the same phase (State), then the component which is in excess is termed the solvent.

Solution

- A SOLUTION can be formed by mixing:-
  LIQUID WITH ANOTHER LIQUID. Ex. Water and Alcohol
  SOLID WITH A LIQUID. Ex. Sugar Solution
- A LIQUID WITH GAS. Ex. Soda Water, Coke
  A SOLID WITH ANOTHER SOLID. Ex. Alloys. Brass has 70% copper and 30% zinc Hence copper is solvent.
- Water is the most common solvent.
- Aqueous solution: A solution produced by dissolving a substance in water is known as aqueous solution.

  TRUE SOLUTION: A solution in which the size of the solute particles is about 10^{-10}m is called a true solution. In a true solution the solute and solvent particles can not be distinguished.

Universal solvent

- Water is called the universal solvent.
- IMPORTANCE OF DISSOLVED SALTS IN WATER:
  The solids which are dissolved in water are salts, minerals and impurities.
  - They are essential for the growth and development of plants.
- They add taste to water
- They supply the essential minerals needed by our bodies.

Suspension

- A suspension is a heterogeneous mixture in which very fine particles about 10^{-7}m of a solid are dispersed in any medium.(Gas or Liquid).
  Fine particles of the solid remain suspended in the medium.
- Ex. Smoke coming out of a chimney
  Chalk dissolved in water
  Muddy pond water

Colloids

- Colloids have particles larger than the particles of true solution but smaller than those of suspension. A colloid has properties that are intermediate between those of a true solution and a suspension. A homogeneous looking heterogenous mixture in which particles having a size between 10^{-10} and 10^{-7} m dispersed in a continuous medium is called COLLOID

Tyndall Effect

- The scattering of a beam of light by colloidal particles present in a colloidal solution is called as Tyndall Effect.
  Zone of scattered light is much larger than the particle itself.
  This is why colloidal particles look like bright spots when viewed at right angles to the beam of light.

- TYNDALL EFFECT IN DAILY LIFE
  Tyndall effect can be observed when a fine beam of light enters a room through a small hole. This happens due to the scattering of light by the particles of dust and smoke in the air.
  Tyndall effect can also be observed when sunlight passes through a dense forest. In the thick forest, mist contains tiny droplets of water acts as colloidal particles inter dispersed in air.

Chromatography

- It is a modern technique used for the separation of a mixture of substances. It involved the separation of mixtures containing coloured substances when separated, formed distinct coloured rings. These zones or rings are named chromatograms.
- Chromatography is used extensively in forensic investigations.

Fractional Distillation

- Fractional distillation is a process which involves distillation and collection of fractions of different liquids boiling at different temperatures.
  If the liquids in a mixture are miscible and have different boiling points they can be separated by distillation.
- SEPERATION OF COMPONENTS OF CRUDE PETROLEUM:
- Crude petroleum is fractionally distilled to get various fractions, at different temperatures some of which are:
- Natural gases. Naphtha. Kerosene oil
- Diesel. Lubricating oil

Physical Change

- A physical change is one that changes the shape, size, physical state, and appearance of a substance but not its chemical composition.
  Example:
  - Ice is heated changed to water than into steam. There is no change in the chemical composition
  - Iron piece is changed into nails, hanger or rod.
  - when solid sugar is dissolved in water, it disappears and resultant solution becomes sweet. Sugar can be recovered by evaporation : removing water
  - Formation of dew
  - Breaking of glass
  - Melting of solids
  - Drying of wet clothes

Physical Change

- Physical change involves change in state, colour only. There is no formation of new substance. Physical change is reversible.

Characteristics of a physical change

- the change is temporary
- no new substance is formed
- there is no alteration in mass
- generally the reaction can be reversed

Chemical Change

- A Chemical change is a permanent change, in which the original substance loses its own composition and properties and gives rise to one or more new substances with different compositions and properties.
  Example:
  - Rusting of Iron: iron on rust changes into a brittle brownish powdery substance called rust. Rust is not iron but Iron oxide. So there is a formation of new substance different from iron.
  - Clotting of blood
  - Digestion of food
  - Ripening of fruit
  - Burning of wood
  - Making of wine
  - Decomposition of a compound
  - Photosynthesis

Burning Combustion

- Burning or combustion is a chemical change, in which combustible substances combine with oxygen to produce new compounds, called oxides. In the reaction there is a liberation of large amount of energy in the form of heat and light.
  The oxygen in air is mainly responsible for burning.

Example:

- If building is on fire and there is strong wind it is difficult to put out the fire

- If a small object catches fire, the fire is put out by covering it up with sand or a blanket. We are cutting out the oxygen availability thus fire is put out.

Conditions necessary for burning

- There must be a combustible substance
- There must be a continuous supply of supporter of combustion like air or oxygen
- The temperature of combustible substance should be above its ignition temperature.
- COMBUSTIBLE SUBSTANCE: Substances that burn in air are said to be combustible.
  Ex. Wood, coal, sulphur, petrol, hydrogen, gas etc.
  INFLAMMABLE SUBSTANCE:A combustible liquid or gas which burns with a flame is called inflammable substance Ex. Petrol, kerosene etc.

Conditions necessary for burning

- SUPPORTER OF COMBUSTION: The gaseous environment that supports combustion are called supporter of combustion. Air oxygen is the most commonly known supporter of combustion.
- Other supporters are nitrous oxide, fluorine and chlorine The gaseous environment that does not allow oxidation to occur is called non-supporter of combustion.

  Example: Hydrogen, nitrogen, hydrogen chloride gas, carbon monoxide, carbon dioxide

Ignition Temperature

- IGNITION TEMPERATURE: It is the minimum temperature at which a substance catches fire and starts burning. Ignition temperature is different for different substances Phosphorus 35^{o}C.

  Petrol and Diesel have low ignition temperature that's why smoking is ban at petrol pumps.

Oxidation of Lead and Copper

- A white deposit is formed on the surface of lead when it is exposed to moist air. White deposit is the lead hydroxide. Copper forms a green deposit on its surface when exposed to moist air. This deposit is copper sulphate.

Importance of Nitrogen

- Nitrogen is an inactive gas. Air has about 79% of Nitrogen.
- Nitrogen moderates the activity of Oxygen. It helps in keeping the rates of combustion, respiration and of oxidation of food at its proper level.
- Nitrogen is essential for producing plant protein and thus plant growth.
- Proteins are essential for building body tissues. Nitrogen is an essential constituent of all living cells of plants, animals and human beings. It is present in cells as proteins.

Importance of Nitrogen

- Animals and human beings depend on plants for their food, containing proteins, and plants in turn depend on nitrogenous compounds like nitrates.
- The nitrogen content of the soil gets depleted after the crops of cereal like wheat and rice.
- The level of nitrogen in soil is restored by growing leguminous plants. Leguminous plants have nodules. In their roots. Bacteria present in nodules fix nitrogen for the plants. This process of fixing nitrogen is called Nitrogen Fixation.
- During Lightening discharge also nitrogen is fixed in the atmosphere.

Rusting of Iron

- When iron is exposed to water and oxygen rusting takes place.
- There is a oxidation of iron. Oxidation means attaching of oxygen.
- In this case iron changes in to iron oxide.
- This change is chemical change and irreversible.

Balancing of Oxygen and Carbon Dioxide in the Atmosphere

- Both Carbon Dioxide and Oxygen are essential for sustenance of life. Nature maintains the right level of Oxygen and Carbon Dioxide.
- These processes are called Oxygen cycle and Carbon (Dioxide) cycle.

- Thank You