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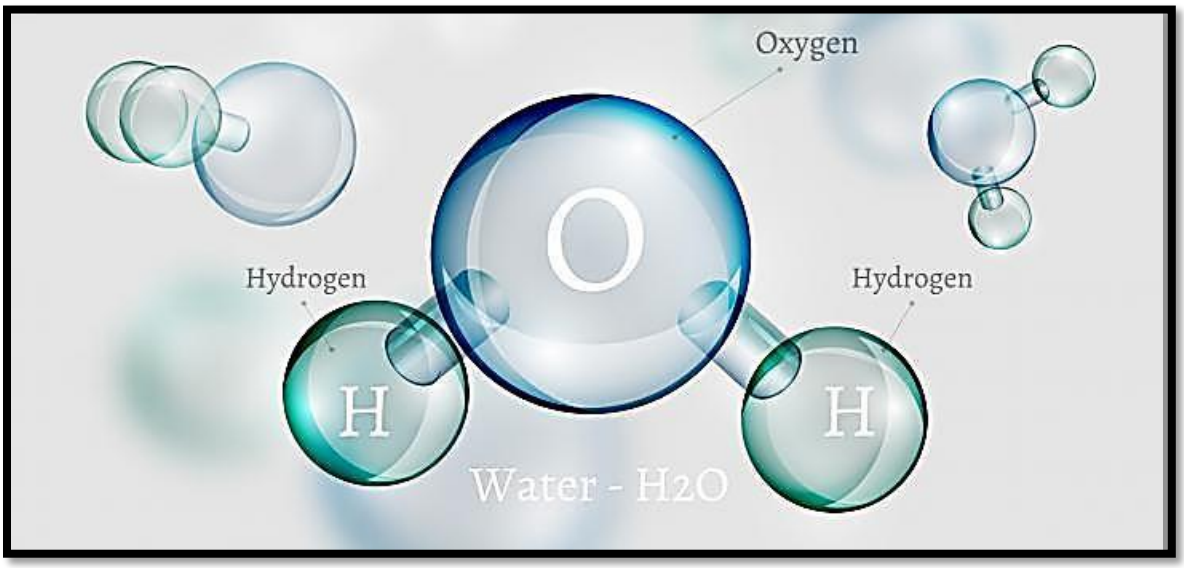
Water, Acids, Bases and pH Enzymes in Living Tissues

Water, Acids, Bases and pH

Water:

Water is one of our most important natural resources and essential for the survival of all living things. Water is a made up of tiny units called molecules which are made of even tinier units called atoms. A molecule of water is made of three atoms - two hydrogen atoms and one oxygen atom. The chemical formula for water is H2O. Water can be found in three physical states on earth: liquid, solid (ice) and gas (water vapor). The freezing point of water is 0℃ and the boiling point is 100℃, one liter of water in liquid form weighs about 1kg



Acids:

Acids are substances that contain one or more hydrogen atoms that, in solution, are released as positively charged hydrogen ions. An acid in a water solution tastes sour, changes the colour of blue litmus paper to red, reacts with some metals (e.g., iron) to liberate hydrogen, reacts with bases to form salts.

Acids classified on the basis of their source or origin:

1) **Organic Acid:** This is the acid obtained from organic materials such as plants and animals. For e.g. Citric acid (Citrus fruits), Acetic acid (Vinegar), Oleic acid (Olive oil), etc.

2) **Mineral Acid:** Mineral acid is procured from minerals. They are also known as inorganic acids. They do not contain carbon. For e.g. H2SO4, HCl. HNO3, etc.

Bases:

Bases are substances that substances that are slippery to touch when in aqueous form. Usually, bases taste bitter. They also change the color of red litmus paper to blue. Bases also dissociate in the water like acids, but instead of producing H+ they produce OH- i.e. hydroxyl ion, some examples are caustic soda or sodium hydroxide, calcium hydroxide or limewater, borax. A lot of bleaches, soaps, detergents, kinds of toothpaste, etc are bases.

* **Bases lose their basicity when mixed with water, acids and bases react to form salt and water. This process is known as neutralization**

PH:

PH stands for Hydrogen potentials. It refers to the concentration of the hydrogen ions in a solution. This is the indicator of a solution's acidity or alkalinity.

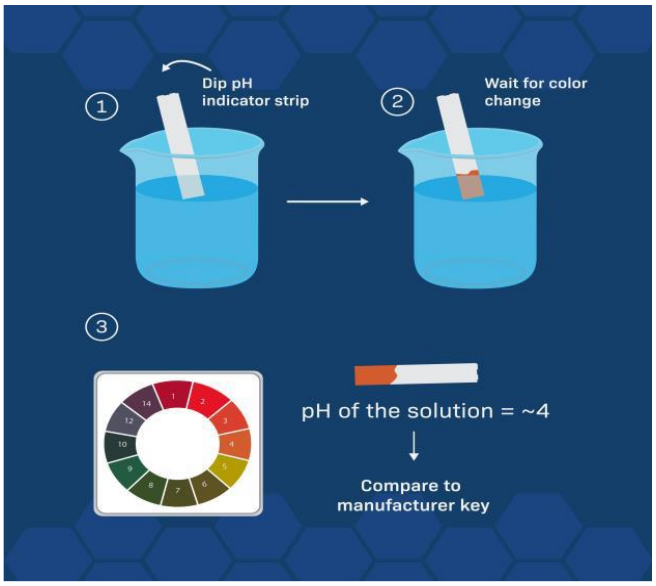
pH of Acids and Bases

The pH of a solution varies from 0 to 14.

Solutions having a value of pH ranging from **0 to 7** on the pH scale are termed as **acidic** and the value of pH ranging from **7 to 14** on pH scale are known as **basic** solutions.
Solutions having the value of pH equal to 7 on pH scale are known as neutral solutions.

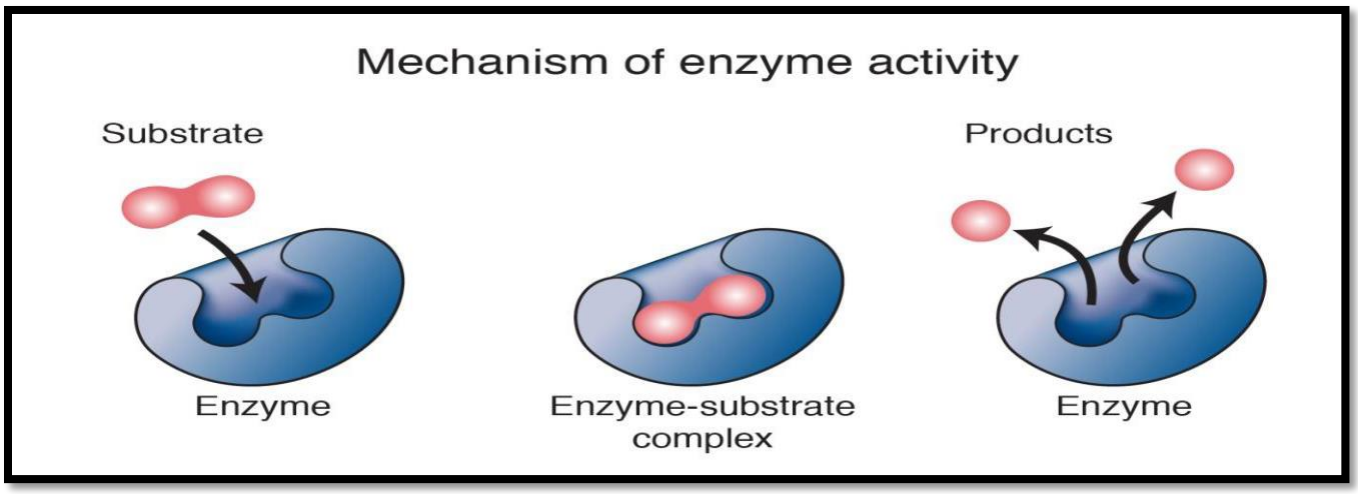
There are two methods for measuring pH:

1- colorimetric methods using indicator solutions or papers.
2- accurate electrochemical methods using electrodes and a millivoltmeter (pH meter).



((Enzymes in Living Tissues))

An enzyme: is a biological catalyst and is almost always a protein. It speeds up the rate of a specific chemical reaction in the cell. The enzyme is not destroyed during the reaction and is used over and over. A cell contains thousands of different types of enzyme molecules, each specific to a particular chemical reaction.
Enzymes are a linear chain of amino acids, which give rise to a three-dimensional structure. The sequence of amino acids specifies the structure, which in turn identifies the catalytic activity of the enzyme. Upon heating, the enzyme's structure denatures, resulting in a loss of enzyme activity, which typically is associated with temperature.



classified based on the type of reaction in which they are used to catalyze. The six kinds of enzymes are **hydrolases, oxidoreductases, lyases, transferases, ligases and isomerases**

Enzymes are found in all tissues and fluids of the body. Catalysis of all reactions taking place in metabolic pathways is carried out by intracellular enzymes. The

enzymes in the plasma membrane govern the catalysis in the cells as a response to cellular signals and enzymes in the circulatory system regulate the clotting of blood. Most of the critical life processes are established on the functions of enzymes.

Types	Biochemical Property
Oxidoreductases	The enzyme Oxidoreductase catalyzes the oxidation reaction where the electrons tend to travel from one form of a molecule to the other.
Transferases	The Transferases enzymes help in the transportation of the functional group among acceptors and donor molecules.
Hydrolases	Hydrolases are hydrolytic enzymes, which catalyze the hydrolysis reaction by adding water to cleave the bond and hydrolyze it.

Lyases	Adds water, carbon dioxide or ammonia across double bonds or eliminate these to create double bonds.
Isomerases	The Isomerases enzymes catalyze the structural shifts present in a molecule, thus causing the change in the shape of the molecule.
Ligases	The Ligases enzymes are known to charge the catalysis of a ligation process.