आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश

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E-Content

IFTM University, Moradabad

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Introduction

- ***pH - represents hydrogen ion potential.***
- It is defined as the common logarithm of the reciprocal of the hydrogen ion concentration.

$$pH = \log 1/[H^+]$$

OR

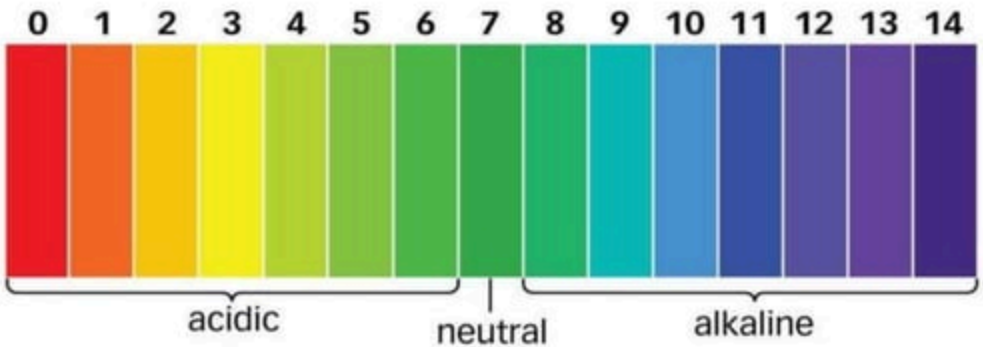
$$pH = -\log [H^+]$$

Sorensen suggested simplified method of expressing hydrogen ion concentration

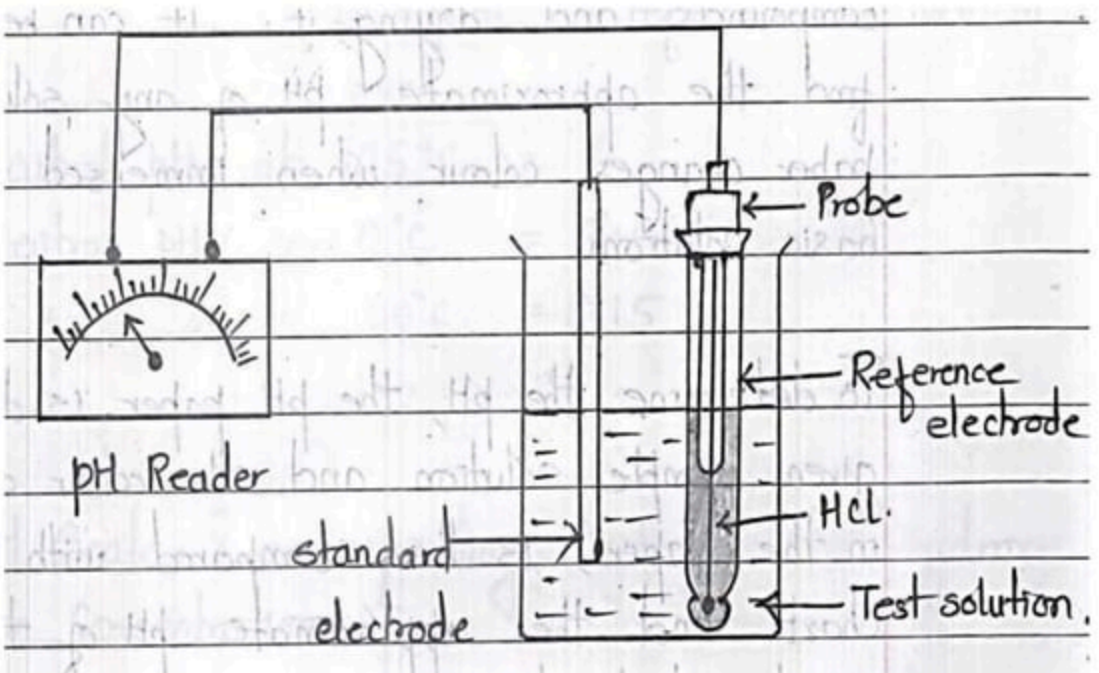
RANGE	COMMENT
0 to 7	ACIDIC
7 to 14	ALKALINE
7	NEUTRAL

pH Determination

1) Colorimetric method – pH paper



2) Electrometric method –pH meter



Applications of Electrometric method

1) To find out the concentration of H+ ion.

2) To find out the concentration of OH- ion.

3) To find out the concentration of buffers to be added.

4) To improve the stability, solubility and purity of given solution.

Buffers

- Buffers are compounds or mixtures of compounds that resist changes in pH, even after the addition of small quantities of acids or alkali.
- Buffers are classified as:

1) Acidic buffer –pH less than 7

- Its combination of weak acid and its salt. Eg: CH_3COOH & CH_3COONa.

2) Basic buffer –pH more than 7

- Its combination of weak base and its salt. Eg: NH_4OH & NH_4Cl.

Applications of Buffers

- Maintenance of life
- Biochemical assay
- In shampoos
- In brewing industry
- In textile industry
- In baby lotions

- **Buffer equation-** Also referred as Henderson Haselbalch equation. It is used to calculate the pH of the solution or to find out the concentration of H+ ions.
- **Buffer Capacity-** It is defined as the resistance offered by the buffer in the change pH on addition of small amount of acid or Base.
- It is also defined as the ratio of small increment caused by strong acid or strong bases causing small changes in the pH on its addition

Buffer Capacity

- ***Is defined as the resistance offered by the buffer in the change in pH on addition of small amount of acid or base.***
- It is denoted by β.
- **Buffer capacity** is also defined as the ***ratio of small increment caused by strong acids or strong bases causing small change in the pH on its addition.***

$$\beta = \frac{\Delta B}{\Delta pH}$$

Buffers in Pharmaceutical and Biological systems

- ***Buffers in Pharmaceutical systems***

1) Solid dosage form- to reduce gastric irritation caused by acidic drugs (Sodium bicarbonate, Mg Carbonate and sodium citrate.)

2) Semi solid dosage forms- to maintain the stability during storage. (citric acid,sodium citrate or phosphoric acid)

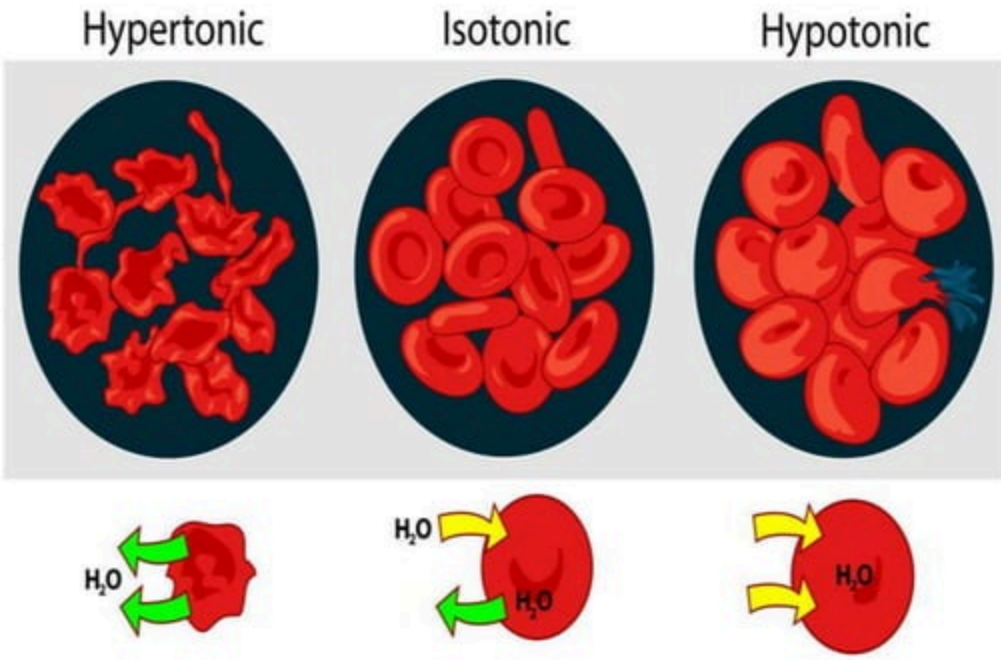
- 3) Parentral Products- to maintain the pH near about blood pH 7.4, hence reduces tissue necrosis(pH> 10) and pain (pH< 3). (Citrate, Glutamate, Pthalate and acetate)
- 4) Opthalmic Products- to prevent increase in pH for maintaining of solubility and stability.

Buffers in Biological systems

- Primary buffer- in plasma (Carbonic acid/ bicarbonate and acid/ alkali sodium salts of phosphoric acid.)
- Secondary buffer – in erythrocytes (hemoglobin/ oxyhemoglobin and acid/alkali Potassium salts of phosphoric acid .
- Lacrimal fluid- tear (7.4) with pH range 7-8. Eye drop (4-10) not harm to cornea. pH ranges below 6.6 and above 9 may cause discomfort and flow of tear.

Buffered Isotonic solution

- ***Isotonic solution:*** refers to solutions having same osmotic pressure across a semipermeable membrane. Eg: 0.9% NaCl solution.
- ***Hypertonic solution:*** refers to solution where the concentration of solutes is greater outside the cell than inside it. Eg: 2% NaCl solution. It leads to cell shrinkage or crenation.
- ***Hypotonic solution:*** refers to solution where the concentration of solutes is greater inside the cell than outside it. Eg: 0.2% NaCl solution. It leads to swelling and finally hemolysis.


Hypertonic
Isotonic
Hypotonic
H_2O
H_2O
H_2O
H_2O

Tonicity and Measurements of tonicity

- Is the concentration of only the solutes that cannot cross the membrane since these solutes exert osmotic pressure on that membrane.
- **Methods:**

1) Hemolytic method
2) Measurement of slight temperature differences.
3) Calculating tonicity using Liso values.

Methods of adjusting Tonicity & pH

CLASS I METHOD

- Sodium chloride is added to drug solution to make it isotonic with body fluids.

CLASS II METHOD

- Water is added to drug solution to make it isotonic with body fluids.


Thank
you!