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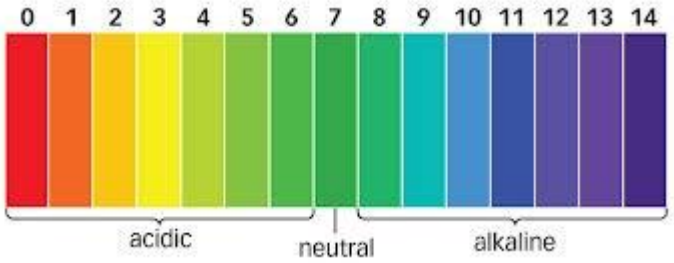
pH and pH Buffers

Definition of pH:

- pH is the negative logarithm of the hydrogen ion concentration.
- In chemistry, pH is a measure of the acidity or alkalinity of an aqueous solution.
- pH is a measure of the concentration of hydrogens ions (H+ ions or protons) in a solution.

pH Scale:

- The pH scale was defined by Sören Sörensen, Danish biochemist, in 1909.The pH scale measures how acidic or alkalinity a substance is.
- The pH scale ranges from 0 to 14. A pH of 7 is neutral. A pH less than 7 is acidic and a pH more than 7 is alkaline.



Measuring pH:

- Measuring pH is essential not only in finding the chemical characteristics of a substance but also as the first step toward managing chemical reactions.
- Measuring pH involve either the use of pH measuring electrodes or indicators whose colors are dependent on pH. A pH meter measures the difference in potential between a reference electrode insensitive to changes in pH and an electrode sensitive to such changes.

pH Indicators:

- pH indicators based on color changes are normally used in the form of pH papers. The paper is wetted with the solution being measured and the resulting color is compared with color standards to determine the pH.

- PH paper is treated with a chemical indicator that changes in the presence of hydroxide or hydrogen ions. Such chemical indicators can be found in foods such as red cabbage, strawberries or blueberries

Why the Color Change?

- This pH paper changes color in different pH solutions because of the chemical flavin, which is a pigment present in red cabbage. This molecule, which is an anthocyanin, is soluble in water and changes color in the presence of various types of solutions. In the presence of an acidic solution, it turns red. In the presence of a alkaline solution, it turns greenish. In the presence of a neutral solution, it turns purple, as indicated by administrator L. Bry at MadSci Research.

pH buffers

- A pH buffer is a substance that resists a change in pH when small amounts of an acid or a base are added to it. The pH of a buffer changes very little when small amounts of an acid or a base is added to the buffered solution. A buffer consists of approximately equal amounts of conjugate weak acid/base pair in equilibrium with each other . Strong acids and their conjugate bases do not produce a buffer since in strong acid ionization is complete and there is no equilibrium.

Factors influencing pH changes during a Textile dyeing process?

a. Water quality
b. Reaction products
c. Additives during the process
d. Time
e. Temperature
f. Contaminants in the substrates.

Some pH buffers systems useful in textile pretreatment, dyeing and finishing.

HCl and sodium citrate	-	pH 1-5
Citric Acid and sodium Citrate	-	pH 2.5-5.6
Acetic Acid and Sodium Acetate	-	pH 3.7-5.6
K2HPO4 and KH2PO4	-	pH 5.8-8.0
Na2HPO4 and NaH2PO4	-	pH 6-7.5
Borax and NaOH	-	pH 9.2-11

PH in textile coloration

- Most of the dyeing processes requires a controlled pH, such as slightly alkaline in direct dyes, strong alkaline in reactive, vat and azoics, acidic in disperse and basic dyes strongly acidic in acid dyes etc.

Many processes of textile processing are pH dependent.

a. Scouring of cotton in highly alkaline conditions
b. Bleaching of different substrates where pH has to be maintained for proper bleaching action
c. Solubilising the dyestuffs.
d. Exhaustion and fixation
e. Oxidation
f. Stripping
g. Finishing

"Have a happy week ahead"