Buffer solution and it's Application.

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A Buffer solution is that solution which can resist the change in pH even after the addition of small amount of acid or base ~~solution~~ solution from outside ~~is called~~

In a biological system, blood is an example of buffer solution and it's pH remains almost constant to 7.4 ~~or~~ and maintained by by ~~act~~ addition of H_2CO_3, $NaHCO_3$ and CO_2.

Blood (pH = 7.35 – 7.44) → maintained by H_2CO_3 & $NaHCO_3$.

(Tendency to resist change in pH after addition of acid or base.)

~~Buffer solutions~~

Buffer solutions are of two types:-

① Acidic buffer solution.

The acidic buffer solution prepared by mixing equimolar concentrated solution of weak acid and it's salt solution is called acidic buffer solution.

eg.

The pH value of acidic buffer solution is less than 7

e.g. (CH_3COOH + CH_3COONa) → Acidic buffer solution

weak base (salt)

pH = 4.7

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(ii) Basic Buffer solution:-

The buffer solution prepared by mixing of equimolar concent quantities of weak base and its salt solution is called basic buffer solution.

The pH value of basic buffer solution is more than 7.

examples:-

The equimolar mixture of solution of NH_4OH and its salt solution NH_4Cl.

Sol^n of NH_4OH + solution of NH_4Cl $\Rightarrow$ pH = 9.25
(weak base) (Salt)

$H_2CO_3 + NaHCO_3 \longrightarrow$ pH = 7.35.

The pH of buffer solution can be calculated by Henderson equation.

$$pH = pK_a + \log \frac{[salt]}{[Acid]}$$ (for acidic buffer)

$$pOH = pK_b + \log \frac{[salt]}{[Base]}$$ [For basic buffer]

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Applications of Buffer Solution.

1. Maintenance of life:-

Most biochemical process work within a relatively small pH values.

The body uses buffers solution to maintain a constant pH.

eg. Blood contains a carbonate/bicarbonate buffer to maintain pH close to 7.35 ± 0.05

2. In industry → In brewing industry - Buffer solutions are added before fermentation begins. It prevents the solutions becoming too acidic and spoiling the product

→ In textile, paper, drugs ~~industry~~. pharmaceutical industry → It used for the manufactures of paper, dyes, ink, paint, drugs etc.

(3) In sampoos.

citric acid/~~solution~~ sodium citrate balance the pH of sampoos.

(4) In analytical chemistry → for qualitative analysis of group III A and III B, the solution of salts are buffered by $NH_4Cl + NH_4OH$.

~~Nitric~~