

Salt Solutions As Weak Acids or Bases

SALTS THAT PRODUCE NEUTRAL SOLUTIONS:

Recall that strong acids and bases ionize completely. If you have a salt that contains the conjugate base of a strong acid (Ex. HCl (Cl^-), HNO_3 (NO_3^-)), that anion (does, does not) have an affinity to react to form a molecule.

Cations from strong bases (Ex. NaOH (Na^+), LiOH (Li^+)) have no affinity for reacting as well.

Therefore, salts that contain the cations from strong bases and the anions from strong acids remain in solution ~~form~~ and (do, do not) change the pH of a solution.

Ex. NaCl , LiBr , KNO_3 , NaSO_4 , KClO_4

SALTS THAT PRODUCE ACIDIC OR BASIC SOLUTIONS:

When some salts dissolve, the ions in solution do not remain in ion form. These ions can react with water. This can result in the formation of either H^+ or OH^- . This process is called hydrolysis.

Ex. Consider the salt, sodium acetate. When this salt dissolves, what species are present in the solution? Na^+ , $\text{C}_2\text{H}_3\text{O}_2^-$, H_2O (H^+ + OH^- in = amounts)

Which of those species will remain as ions and which will wish to react to form a molecule? Ions $\rightarrow \text{Na}^+$ React $\text{C}_2\text{H}_3\text{O}_2^-$

Therefore, the Na^+ ion will not undergo hydrolysis, while the $\text{C}_2\text{H}_3\text{O}_2^-$ ion will.

Write the hydrolysis reaction that occurs: $\text{C}_2\text{H}_3\text{O}_2^- + \text{H}_2\text{O} \rightleftharpoons \text{HC}_2\text{H}_3\text{O}_2 + \text{OH}^-$

Since this salt produces OH^- as a result of the hydrolysis, the resulting solution will be basic and the pH of this solution will > 7 .

Conclusion: If a salt solution undergoes hydrolysis and forms H^+ , this makes the previously neutral solution becomes acidic. If it forms OH^- , the solution becomes basic.

GENERAL RULE FOR DETERMINING IF A SALT SOLUTION WILL BE ACID, BASE OR NEUTRAL:

A basic solution results from any salt whose cation is from a strong base and whose anion is the conjugate base of a weak acid.

An acidic solution results from any salt whose anion is from a strong acid and whose cation is the conjugate acid of a weak base.

A neutral solution results from the cation of a strong base and the anion of a strong acid.