

Salts:

Ionic cmpds

Completely dissociate in water

Are electrolytes

Can behave as acid or base

Acid-base properties due to
behavior of their constituent
cations and anions

pH qualitatively decided

considering the ions in the salt

Neutral Solutions:

Cations of strong base

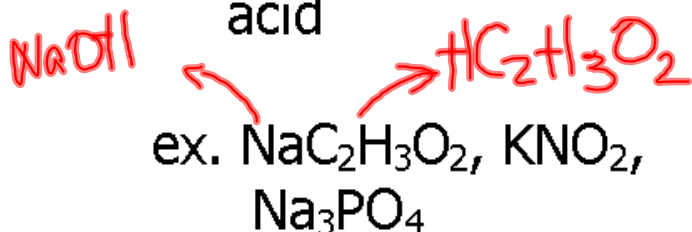
or anions of strong acids

Ex. NaCl, KNO₃, KCl



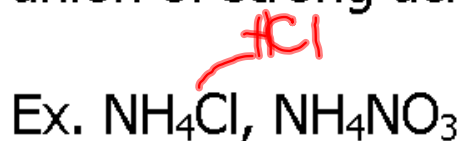
Basic Solutions:

Cations of strong bases
and anion from weak
acid

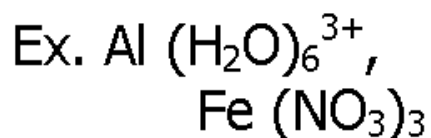


Acidic Solutions:

Cation of weak base and
anion of strong acid



Contains highly charged
metal ion
may be hydrated



Cation of weak base and
anion of weak acid

Compare the K_a and
 K_b values

$K_a > K_b$ acidic

$K_b > K_a$ basic

$K_a = K_b$ neutral

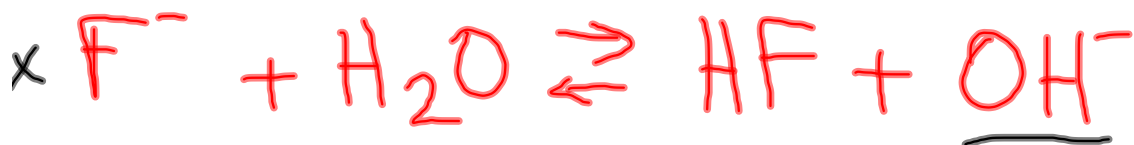
Ex. $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$,
 NH_4NO_2

$$K_a \cdot K_b = K_w$$

$$\text{pH} + \text{pOH} = 14$$
$$\text{p}K_a + \text{p}K_b = 14$$

Example 1:

Calculate the pH of a 0.30 M NaF solution. The K_a value for HF is 7.2×10^{-4} .



$$K_a \cdot K_b = K_w$$

$$\underline{K_b} = \frac{K_w}{K_a}$$

$$= \frac{1.0 \times 10^{-14}}{7.2 \times 10^{-4}}$$

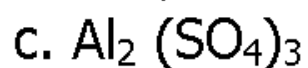
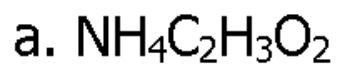
$$= 1.4 \times 10^{-11}$$

$K_a > K_b$ should be acidic

2. Calculate the pH of a 0.10 M NH_4Cl solution. K_b for NH_3 is 1.8×10^{-5} .

3. Calculate the pH of a 0.0100 M AlCl_3 solution. K_a for $\text{Al}(\text{H}_2\text{O})_6^{3+}$ is 1.4×10^{-5} .

4. Predict whether an aqueous solution of each of the following salts will be acidic, basic, or neutral.



5. Predict whether Na_2HPO_4 will form an acidic or basic solution.

2. Predict whether the dipotassium salt of citric acid ($\text{K}_2\text{HC}_6\text{H}_5\text{O}_7$) will form an acidic or basic solution.

Table 14.6**Acid–Base Properties of Various Types of Salts**

Type of Salt	Examples	Comment	pH of Solution
Cation is from strong base; anion is from strong acid	KCl, KNO ₃ , NaCl, NaNO ₃	Neither acts as an acid or a base	Neutral
Cation is from strong base; anion is from weak acid	NaC ₂ H ₃ O ₂ , KCN, NaF	Anion acts as a base; cation has no effect on pH	Basic
Cation is conjugate acid of weak base; anion is from strong acid	NH ₄ Cl, NH ₄ NO ₃	Cation acts as acid; anion has no effect on pH	Acidic
Cation is conjugate acid of weak base; anion is conjugate base of weak acid	NH ₄ C ₂ H ₃ O ₂ , NH ₄ CN	Cation acts as an acid; anion acts as a base	Acidic if $K_a > K_b$, basic if $K_b > K_a$, neutral if $K_a = K_b$
Cation is highly charged metal ion; anion is from strong acid	Al(NO ₃) ₃ , FeCl ₃	Hydrated cation acts as an acid; anion has no effect on pH	Acidic