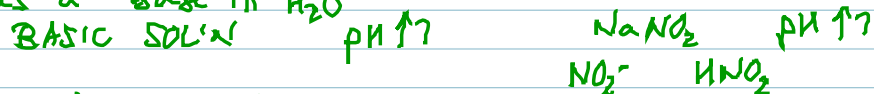


SALT HYDROLYSIS reaction w/ $H_2O \rightarrow$ acidic or basic sol'n

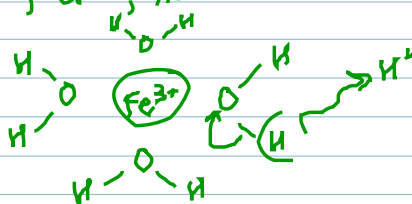
① If the anion is the conjugate base of a weak acid, it behaves as a base in H_2O



② If the cation is the conjugate acid of a weak base (NH_4^+)
 ACIDIC SOL'N $pH \downarrow$



③ If the cation is a small highly charged metal ion, it causes H_2O to become acidic $pH \downarrow$
 $Be^{2+}, Fe^{3+}, Cr^{3+}, Al^{3+}$



④ If the cation is acidic AND the anion is basic
 K_a vs. K_b

KCl K^+ NO EFFECT $pH=7$
 Cl^- NO EFFECT

NaF Na^+ NO EFFECT $pH \uparrow$
 F^- BASIC

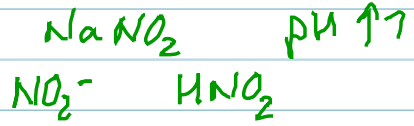
$Al(NO_3)_3$ Al^{3+} ACIDIC $pH \downarrow$
 NO_3^- NO EFFECT

NH_4CN
 NH_4^+ ACIDIC
 CN^- BASIC
 $5.7 \times 10^{-10} K_a$
 $2.0 \times 10^{-5} K_b$

SALT HYDROLYSIS reaction w/ $H_2O \rightarrow$ acidic or basic sol'n

① If the anion is the conjugate base of a weak acid, it behaves as a base in H_2O

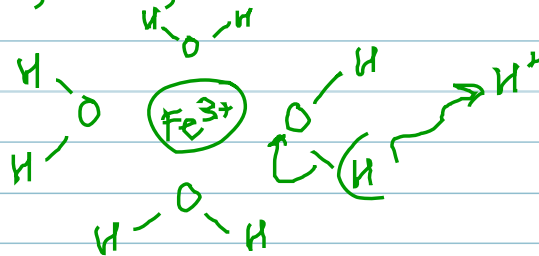
BASIC SOL'N $pH \uparrow$



② If the cation is the conjugate acid of a weak base (NH_4^+)
 ACIDIC SOL'N $pH \downarrow$



③ If the cation is a small highly charged metal ion, it causes H_2O to become acidic $pH \downarrow$
 $Be^{2+}, Fe^{3+}, Cr^{3+}, Al^{3+}$

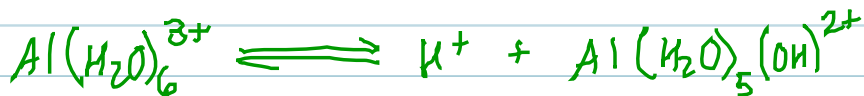


④ If the cation is acidic and the anion is basic
 K_a vs. K_b

KCl	K^+ NO EFFECT	Cl^- NO EFFECT	$pH = 7$	NH_4CN	NH_4^+ ACIDIC	CN^- BASIC
NaF	Na^+ NO EFFECT	F^- BASIC	$pH \uparrow$			$5.7 \times 10^{-10} K_a$
$Al(NO_3)_3$	Al^{3+} ACIDIC	NO_3^- NO EFFECT	$pH \downarrow$			$2.0 \times 10^{-5} K_b$

What is the pH of a 0.010 M $AlCl_3$ solution?

$Al^{3+} \rightarrow$ cause H_2O to become acidic $K_a = 1.0 \times 10^{-5}$



$$0.010 - x \approx 0.010$$

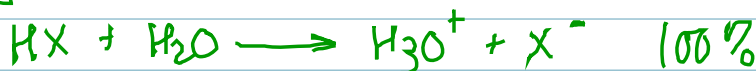
$$K_a = 1.0 \times 10^{-5} = \frac{x^2}{0.010}$$

$$x \Rightarrow 3.2 \times 10^{-4} = [H^+]$$

$$pH = -\log x = 3.50$$

ACID/BASE HYDROLYSIS

Strong acid



Weak acid



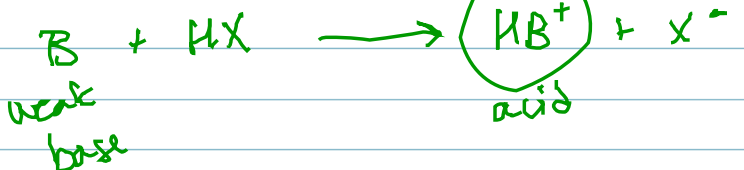
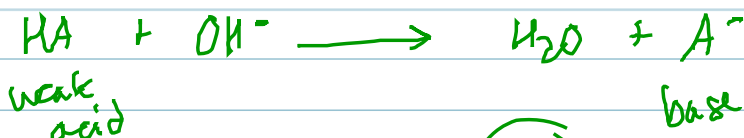
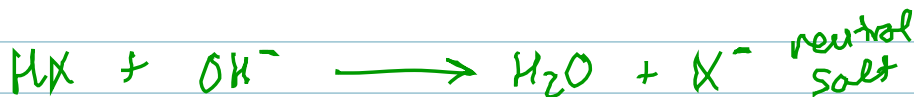
Strong base



Weak base



NEUTRALIZATION / ACID-BASE REACTION!



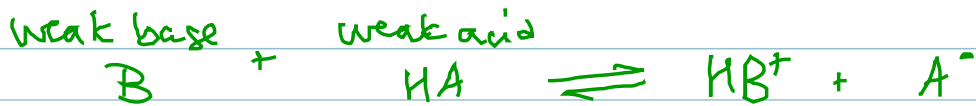
pH \uparrow 7

pH \downarrow 7

Watch out for

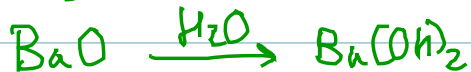
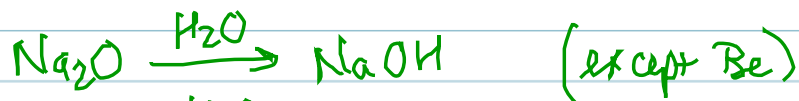
LIM REAGENTS

BUFFER

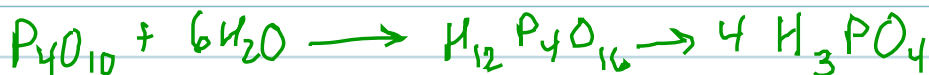
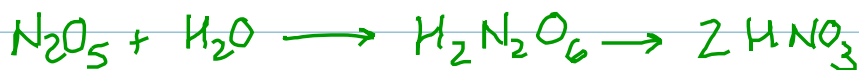
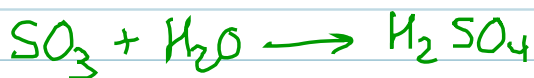
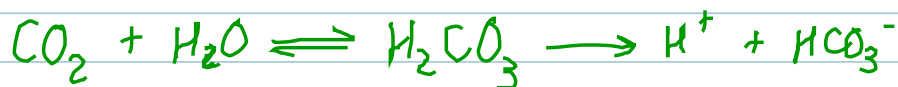


ACIDIC / BASIC / AMPHOTERIC OXIDES

① IA, IIA \Rightarrow BASIC OXIDES
(BASIC ANHYDRIDES)



② Nonmetal oxides \Rightarrow ACIDIC OXIDES
(ACIDIC ANHYDRIDES)



③ Amphoteric oxides

BeO, IIIA, IVA metals