Lecture 11.3 An Introduction to weak Bases.

Note Title 10/3/2011

1.00M
$NH_{3(aq)}$ ←

base ← acid → acid → base

$NH_{3(aq)} + H_2O_{(l)} \rightleftharpoons NH_4^+{}_{(aq)} + OH^-{}_{(aq)}$ $K_b = 1.76\times10^{-5}$

reactants

i	1.00 M	~	0 M	0 M
c	$-x$	→	x	x
e	$1.00-x$		x	x

L.M.A. $K_b = \frac{[NH_4^+][OH^-]_e}{[NH_3]_e}$ $\Big|$ $1.76\times10^{-5} = \frac{x\ x}{(1.00-\underset{\approx 0}{x})}$

$x = 4.1952\times10^{-3}$

$[OH^-] = 4.1952\times10^{-3}$

$pOH = -\log[OH^-] = 2.377$ ---- pOH

$pH = 14 - pOH = 14 - 2.377 = 11.622 \ldots > 7$ basic pH

Present in solution NH_4^+ ⋮ NH_3 ⋮ H_2O

base

weak base $\cancel{NH_{3(aq)}} + H_2O_{(l)} \rightleftharpoons \cancel{NH_4^+}_{(aq)} + OH^-_{(aq)}$ K_b

acid

weak acid $\cancel{NH_4^+}_{(aq)} + H_2O_{(l)} \rightleftharpoons \cancel{NH_3}_{(aq)} + H_3O^+_{(aq)}$ K_a

Net rxn $H_2O_{(l)} + H_2O_{(l)} \rightleftharpoons OH^-_{(aq)} + H_3O^+_{(aq)}$ K_w

more than one equil. ... net rxn ... mult. equil constants

$K_b \cdot K_a = K_w = 1.00\times10^{-14}$ @ 25°C.

Example. K_a for CH_3COOH is 1.8×10^{-5}. What is the K_b value for acetic acids conj. base?

acid : CH_3COOH $K_a = 1.8\times10^{-5}$

base : CH_3COO^- $K_b = K_w/K_a = 1.00\times10^{-14}/1.8\times10^{-5} = 5.5\times10^{-10}$

favoring reactants