6/5/20

Review

1) pH of a soln of a weak acid

$$HNO_{2(aq)} \rightleftharpoons H^+_{(aq)} + NO_2^-{}_{(aq)}$$

The pH of a soln of an acid is due to the dissociation of that acid.

Need: the K_a / pK_a of the acid

2) pH / pOH of a soln of a weak base

$$CH_3NH_{2(aq)} + H_2O_{(l)} \rightleftharpoons CH_3\overset{\oplus}{N}H_3 + OH^-_{(aq)}$$

ammonia NH_3 ammonium NH_4^+

The pH / pOH of a solution of a base is due to *1) the reaction of the base with water (BL base) or 2) the dissociation of the base in water

Need: the K_b / pK_b of the base

$[OH^-]$ is in the ICE problem, not $[H^+]$

3) pH of a solution of a conjugate of a weak base

— Dissolve NH_4Cl in water

$NH_4Cl(aq) \rightleftharpoons NH_4^+(aq) + Cl^-(aq)$

strong electrolyte

$Cl^-(aq)$ conjugate of HCl, so Cl^- is not basic (HCl is strong)

$NH_4^+(aq) \rightleftharpoons NH_3(aq) + H^+(aq)$

$NH_4^+(aq)$ conjugate of a weak base, so NH_4^+ is acidic

— Neutralize CH_3NH_2 with HCl

$CH_3NH_2 + HCl \rightarrow CH_3\overset{\oplus}{N}H_3 \; :\ddot{Cl}:^{\ominus}$

Since this product is the conjugate of a weak base, if it is forced to form by neutralization, it will then establish equilibrium by dissociating

$CH_3\overset{\oplus}{N}H_3(aq) \rightleftharpoons CH_3NH_2(aq) + H^+(aq)$

Need conjugate K_a/pK_a from base K_B/pK_B

4) pH of a sol'n of the conjugate of a weak acid L3

— Dissolve $NaOCH_3$ in water

methoxide

$NaOCH_{3(aq)} + H_2O \rightleftharpoons CH_3OH_{(aq)} + OH^-_{(aq)} + Na^+_{(aq)}$

$B^- + H_2O \rightleftharpoons BH + OH$

Sodium is not acidic - (spectator)

— Fully neutralize CH_3COOH

$CH_3COOH_{(aq)} + NaOH_{(aq)} \rightarrow CH_3COONa_{(aq)} + H_2O_{(l)}$

conjugate of a weak acid → base

$CH_3COO^-_{(aq)} + H_2O_{(l)} \rightleftharpoons CH_3COOH_{(aq)} + OH^-_{(aq)}$

Need: Conjugate K_b/pK_b from acid K_a/pK_a

$[OH^-]$ is in the ICE problem, not $[H^+]$

Strong acids — HNO_3, H_2SO_4, HCl, HBr, HI, $HClO_4$

Weak acids — HF, CH_3COOH (carboxylic acids), HNO_2, H_2SO_3, H_3PO_4