South Pasadena • AP Chemistry

Name Grover
Date ___/___/___ Period ___

18 • Acids-Base Reactions

QUICK CHECK 2

☐ **pH of a weak acid solution**

Calculate the pH of a 0.200 M solution of nitrous acid, HNO_2. K_a of $HNO_2 = 4.0 \times 10^{-4}$.

$HNO_2 \rightleftharpoons H^+ + NO_2^-$

.200 M	0	0
− x	+ x	+ x
.200 − x	x	x

assume $x << .200$
$\therefore (.200 - x) \approx (.200)$

$K_a = \frac{[H^+][NO_2^-]}{[HNO_2]} = 4.0 \times 10^{-4}$

$\frac{x^2}{.200} = 4.0 \times 10^{-4}$

$[H^+] = x = \sqrt{(.200)(4.0 \times 10^{-4})} = 8.944 \times 10^{-3}$ M

$pH = -\log [H^+] = 2.048453 = \boxed{2.05}$

☐ **Salt solutions**

A solution of $NaNO_2$ will be basic (acidic, basic, neutral).

Write the ***net*** equation for the equilibrium involved when $NaNO_2$ dissolves in water.

$NO_2^- + H_2O \rightleftharpoons HNO_2 + OH^-$

Write the equilibrium expression for the above equation. Should this be labeled K_c, ~~K_a~~, K_b, K_{eq}?

$K_b = \frac{[HNO_2][OH^-]}{[NO_2^-]} = \frac{K_w}{K_a} = \frac{1 \times 10^{-14}}{4.0 \times 10^{-4}} = 2.5 \times 10^{-11}$

Calculate the pH of a 0.100 M solution of $NaNO_2$.

$NO_2^- + H_2O \rightleftharpoons HNO_2 + OH^-$

I	.100 M	0	0
C	− x	+ x	+ x
E	.100 − x	x	x

assume $x << .100$
$\therefore (.100 - x) \approx (.100)$

$K_b = \frac{[HNO_2][OH^-]}{[NO_2^-]} = 2.5 \times 10^{-11}$

$= \frac{x^2}{.100} = 2.5 \times 10^{-11}$

$x = [OH^-] = \sqrt{(.100)(2.5 \times 10^{-11})}$
$= 1.58 \times 10^{-6}$

$pOH = -\log [OH^-] = 5.80$

$pH = 14 - pOH = \boxed{8.20}$

☐ **Acid-Base Neutralization**

Write the balanced net equation for:
A solution of sulfurous acid is added to a suspension of magnesium hydroxide
(weak) (solid)

$H_2SO_3 + Mg(OH)_2 \rightarrow 2H_2O + MgSO_3$

NO SPECTATOR IONS