14.4 pH of SA's

neutral

$HCl_{(aq)} \rightleftharpoons H^+_{(aq)} + Cl^-_{(aq)}$

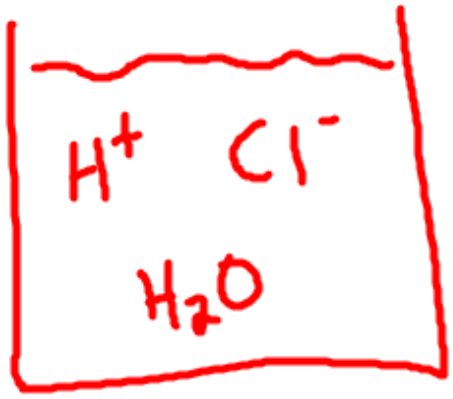
.20M .20M .20M

$pH = -\log(.20)$

$= .70$

major species: H^+, Cl^-, H_2O

which is the strongest acid



HCl

or

H_2O $K_w = 1 \times 10^{-14}$

$[H^+] = 1 \times 10^{-7}$ M

pH of weak Acids

$HC_2H_3O_2$

Calculate the pH of a 0.100M acetic acid solution. $K_a = 1.8 \times 10^{-5}$ which is stronger?

MS: H_2O, $HC_2H_3O_2$

rxn: $HC_2H_3O_2(aq) \rightleftharpoons H^+(aq) + C_2H_3O_2^-(aq)$

	$HC_2H_3O_2$		H^+		$C_2H_3O_2^-$
I.	.100 M		0		0
C.	$-x$		$+x$		$+x$
E.	$.100 - x$		x		x

$$K_a = \frac{[H^+][C_2H_3O_2^-]}{[HC_2H_3O_2]} = \frac{x^2}{.1 - x} \approx_{x \to 0} = 1.8 \times 10^{-5}$$

$x = .0013 = [H^+]$

plt: -log(.0013)

% dissociation

5% check

$\frac{x}{[HA]_0} \times 100$

$\frac{.0013}{.1} \times 100 = 1.3\%$ assumption good

2.89

pH of a mixture of weak acids

1.00 M HCN 1.00 M HNO_2

ms: H_2O, HCl, HNO_2 strongest acid

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

1	0	0
$-x$	$+x$	$+x$
$1-x$	x	x

$$K_a = \frac{[H^+][NO_2^-]}{[HNO_2]} = \frac{x^2}{1-x} = \sqrt{4.0 \times 10^{-4}}$$

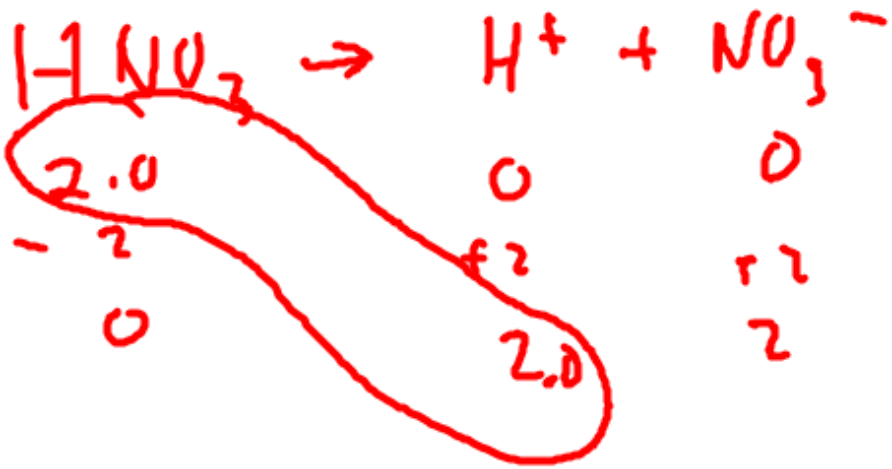
$$x = \frac{.020}{1} \times 100 = 2\%$$

$pH = -\log(.02)$

1.70

pH of 2.0 M HNO_3

MS: H_2O, H^+, NO_3^- [$[HNO_3] \approxeq [H^+]$



$pH = -\log(2)$

$-.30$