

(16.64) $HA + H_2O \rightleftharpoons H_3O^+ + A^-$ (Initial)
 K_a
3 decimal places.

I	$2.22 \times 10^{-2} M$	\rightleftharpoons	H^+	$+$	A^-
A	$-x$	\rightleftharpoons	$+x$	$+$	$+x$
E	$2.22 \times 10^{-2} - x$	\rightleftharpoons	x	$+$	x

Verde \rightarrow *Mol*

$$K_a = \frac{[H^+][A^-]}{[HA]} = 3.3 \times 10^{-4}$$

Ignore "-x" (5%) check

$$\frac{x^2}{2.22 \times 10^{-2}} = \frac{3.3 \times 10^{-4}}{1}$$

$x = 2.71 \times 10^{-3}$ check
pH: 2.56703

$\frac{2.71 \times 10^{-3}}{2.22 \times 10^{-2}} \times 100 = 12.3\% \text{ ionized}$

CAN NOT IGNORE X
Not < 5% ionized

500mg HC = 1000mg
200ml = 0.25l
1g HA / mole = 180g = 0.0056
5.6 x 10⁻³ mole
5.56 x 10⁻³ mole
0.25l

Feb 24-7:39 AM

$$\frac{x^2}{2.22 \times 10^{-2} - x} = \frac{3.3 \times 10^{-4}}{1}$$

$$x^2 + 3.3 \times 10^{-4} x - 7.326 \times 10^{-6} = 0$$

$[H^+] x = 2.55 \times 10^{-3}$

pH = 2.59345981957

Feb 24-8:03 AM

POLY PROTIC ACID H_2CO_3 (PH=?)

$3.7 \times 10^{-3} M$

H_2CO_3	\rightleftharpoons	H^+	$+$	HCO_3^-
3.7×10^{-3}		x		x
$-x$		$+x$		$+x$
$3.7 \times 10^{-3} - x$		x		x

$K_{a1} = \frac{4.3 \times 10^{-7}}{3.7 \times 10^{-3}} = \frac{x^2}{3.7 \times 10^{-3}}$

$x = 3.99 \times 10^{-5}$ (pH = 4.40)

$\frac{3.99 \times 10^{-5}}{3.7 \times 10^{-3}} \times 100 = 1.08\% \text{ ionized}$

HCO_3^-	\rightleftharpoons	H^+	$+$	CO_3^{2-}
3.99×10^{-5}		x		x
$-x$		$+x$		$+x$
$3.99 \times 10^{-5} - x$		x		x

$K_{a2} = \frac{5.6 \times 10^{-11}}{3.99 \times 10^{-5}} = \frac{x^2}{3.99 \times 10^{-5}}$

$x = 4.73 \times 10^{-8} = [H^+]$

$[H^+]_{TOTAL} = 3.99 \times 10^{-5} + 4.73 \times 10^{-8} = 3.995 \times 10^{-5}$

(pH = 4.40)

Almost all $[H^+]$ comes out in 1st dissociation.
No "reqd need" to do 2nd or 3rd depending

Feb 24-8:10 AM

WEAK BASES K_b p1116

Base \downarrow

$$\text{B}^- + \text{HOH} \rightleftharpoons \text{HB} + \text{OH}^-$$

$$\text{B} + \text{HOH} \rightleftharpoons \text{HB}^+ + \text{OH}^-$$

$\text{HA} \rightarrow \text{H}^+ + \text{A}^-$

ACID (Anion Def)

Feb 24-8:30 AM

$\text{HF} \rightarrow \text{H}^+ + \text{F}^-$
ACID Conj Base OH NOOOO!
No OH :-)

* If No H (or OH) Add WATER
 (Why) \rightarrow No effect on pH
 No Δ Mole H^+ or OH^-

Feb 24-8:40 AM

(Ex) ^{p1116}
 Base $\text{NH}_3 + \text{H}_2\text{O} \rightarrow \text{NH}_4^+ + \text{OH}^-$
 (SM) H^+ acceptor!
 (pH?)

I	S M	 	 	
D	-x	 	 	+x
E	S-x	 	 	x

$K_b = \frac{[\text{NH}_4^+][\text{OH}^-]}{[\text{NH}_3]} = \frac{1.8 \times 10^{-5}}{1} = \frac{x^2}{5-x}$

$\text{pH} + \text{pOH} = 14$
 $[\text{H}^+][\text{OH}^-] = 1 \times 10^{-14}$
 $x = 9.49 \times 10^{-3} = [\text{OH}^-]$
 $\text{pOH} = 2.02$
pH = 11.98

Feb 24-8:43 AM

(1) $\text{HA} \rightleftharpoons \text{H}^+ + \text{A}^-$
 (2) $\text{A}^- + \text{HOH} \rightleftharpoons \text{HA} + \text{OH}^-$

$\text{HA} \rightleftharpoons \text{H}^+ + \text{A}^-$

$K_a = \frac{[\text{H}^+][\text{A}^-]}{[\text{HA}]}$

$\text{A}^- + \text{HOH} \rightleftharpoons \text{HA} + \text{OH}^-$

$K_b = \frac{[\text{HA}][\text{OH}^-]}{[\text{A}^-]}$

$\text{HOH} \rightleftharpoons \text{H}^+ + \text{OH}^-$

$K_w = K_a * K_b$

$\frac{(\text{H}^+)(\text{A}^-)}{(\text{HA})} * \frac{(\text{HA})(\text{OH}^-)}{(\text{A}^-)} = (\text{H}^+)(\text{OH}^-) = K_w$

Feb 24-8:50 AM

Find pH of 0.1M CN^-

	CN^-	+	HOH	\rightleftharpoons	HCN	+	OH^-
I	0.1				0		0
E	$-x$				$+x$		$+x$
E	$0.1-x$				x		x

$K_b = \frac{x^2}{0.1-x} = 2.04 \times 10^{-5}$

$K_a = 4.9 \times 10^{-10}$
 $K_a * K_b = K_w = 1 \times 10^{-14}$
 $K_b = \frac{K_w}{K_a}$

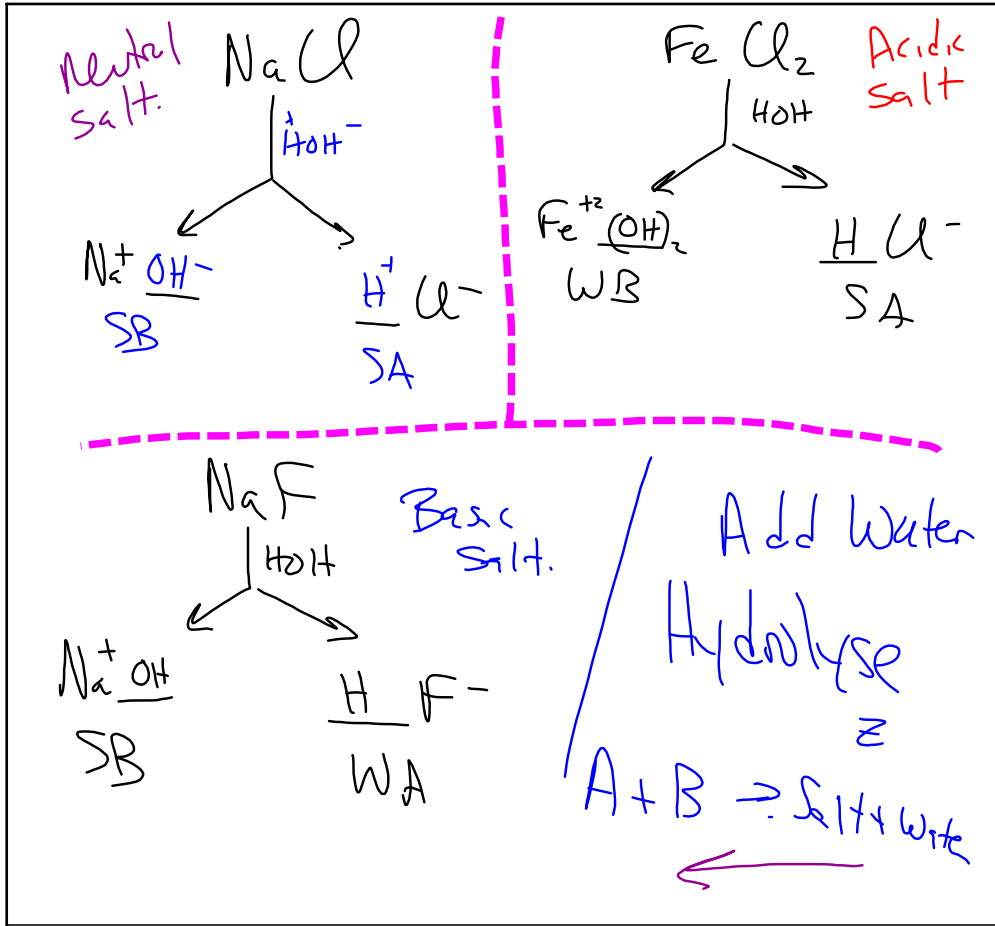
$x^2 = 2.04 \times 10^{-6}$
 $x = 1.43 \times 10^{-3} = [\text{OH}^-]$

$\text{pOH} = 2.85$

$\text{pH} = 11.15$

$\text{pH} + \text{pOH} = 14$

Feb 24-8:58 AM



Feb 24-9:11 AM

PS 16-1 #1-24

Feb 24-9:16 AM