

(16.76) $\text{B}^- + \text{H}_2\text{O} \rightleftharpoons \text{HB} + \text{OH}^-$

I	0.55 M		
Δ	-x	+x	+x
E	0.55-x	1.48×10^{-3}	$1.48 \times 10^{-3} = [\text{OH}^-]$

$K_b = \frac{(\text{HB})(\text{OH}^-)}{(\text{B}^-)} = 4 \times 10^{-6}$

$[\text{H}^+][\text{OH}^-] = 1 \times 10^{-14}$

$\text{pH} = -\log(\text{H}^+)$

$\frac{(x)(x)}{0.55-x} = \frac{4 \times 10^{-6}}{1}$

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(16.78) $\text{C}_8\text{H}_7\text{NO}_3^- + \text{H}_2\text{O} \rightleftharpoons \text{C}_8\text{H}_6\text{NO}_3 + \text{OH}^-$

I	$5 \times 10^{-3} \text{ M}$		
Δ	-x	+x	+x
E	4.91×10^{-3}	8.91×10^{-5}	8.91×10^{-5}

$\text{pH} = 9.95$

$\text{pOH} = 4.05$

$[\text{OH}^-] = 8.91 \times 10^{-5}$

$K_b = \frac{(\text{HA})(\text{OH}^-)}{(\text{A}^-)} = \frac{(8.91 \times 10^{-5})^2}{4.91 \times 10^{-3}} = 1.62 \times 10^{-6} = K_b$

$\text{p}K_b = -\log K_b$

5.79

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Polyprotic Acids

① $\text{H}_2\text{CO}_3 \rightarrow \text{H}^+ + \text{HCO}_3^-$
 $K_{a1} = 4.3 \times 10^{-7}$

H_2CO_3	H^+	HCO_3^-
$\text{I } 3.7 \times 10^{-3} \text{ M}$	$\text{I } 4 \times 10^{-5}$	$\text{I } 4 \times 10^{-5}$
$\Delta -x$	$\Delta +x$	$\Delta +x$
$\text{E } 3.7 \times 10^{-3} - x$	x	x

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

$$x = 4 \times 10^{-5} = [\text{H}^+]$$

Soln
 $\text{pH} = 4.4$

② $\text{HCO}_3^- \rightarrow \text{H}^+ + \text{CO}_3^{2-}$
 $K_{a2} = 5.6 \times 10^{-11}$

HCO_3^-	H^+	CO_3^{2-}
$\text{I } 4 \times 10^{-5}$	$\text{I } 4 \times 10^{-5}$	$\text{I } x$
$\Delta -x$	$\Delta +x$	$\Delta +x$
$\text{E } 4 \times 10^{-5} - x$	$4 \times 10^{-5} + x$	x

$$K_{a2} = \frac{x(4 \times 10^{-5} + x)}{(4 \times 10^{-5} - x)} = 5.6 \times 10^{-11}$$

$$x = 5.6 \times 10^{-11}$$

$$\text{New } [\text{H}^+] = 4 \times 10^{-5} + x = 4.000056 \times 10^{-5}$$

$$\text{pH} = 4.3979$$

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HW

PS 16-1 / 1-20

Mar 3-9:14 AM