[TP] At 25 °C, 0.10 mol each of a strong acid and OH^- are combined in 1.0 L of water. The pH of the solution is ...

25% 1. < 7
25% 2. $= 7$
25% 3. > 7
25% 4. Further information needed

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Response Counter

10

1

Lecture 19 CH102 A2 (MWF 11:15 am)

Monday, March 12, 2018

- Complete: $[H_3O^+]$ when "too much" base added
- Practice: Too little, just enough, too much?
- How much strong acid remains unreacted?
- $[H_3O^+]$ when different amounts of "not enough" base added

Next: Ch15: Solubility, precipitation, and complexation

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Step 2: $[H_3O^+]$ when "too much" base added

$V_b = 200.$ mL of $c_b = 0.30$ M of OH^- is combined with $V_a = 200.$ mL of $c_a = 0.20$ M of HA, $K_a = 1.0 \times 10^{-6}$ and $K_b = K_w / K_a = 1.0 \times 10^{-8}$.

	$A^-(aq)$	$HA(aq)$	$OH^-(aq)$	Q
Initial				
Change				
Equilibrium				
Approximate				

$[OH^-] = ?$

$[H_3O^+] = ?$

$[HA] = ?$

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Step 2: $[H_3O^+]$ when "too much" base added

$V_b = 200.$ mL of $c_b = 0.30$ M of OH^- is combined with $V_a = 200.$ mL of $c_a = 0.20$ M of HA, $K_a = 1.0 \times 10^{-6}$ and $K_b = K_w / K_a = 1.0 \times 10^{-8}$.

	$A^-(aq)$	$HA(aq)$	$OH^-(aq)$	Q
Initial	0.10	0	0.050	0
Change	$-x$	$+x$	$+x$	
Equilibrium	$0.10 - x$	x	$0.050 + x$	K_b
Approximate	≈ 0.10	x	≈ 0.050	K_b

$[OH^-] = 0.050$ (easy!)

$[H_3O^+] = K_w / [OH^-] = \frac{1.0\times10^{-14}}{0.050} = 2.0 \times 10^{-13}$

$[HA] = x = \frac{K_b[A^-]}{[OH^-]} = \frac{1.0\times10^{-8}\times0.10}{0.050} = 2.0 \times 10^{-8}$ (tiny!)

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Too little, just enough, too much?

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[TP] At 25 °C, 0.10 mol each of a strong acid and OH^- are combined in 1.0 L of water. The pH of the solution is ...

0% 1. < 7
0% 2. = 7
0% 3. > 7
0% 4. Further information needed

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Response Counter

10

10

[TP] At 25 °C, 0.10 mol each of a weak acid HA, its conjugate base A^-, and OH^- are combined in 1.0 L of water. The pH of the solution is ...

0% 1. < 7
0% 2. = 7
0% 3. > 7
0% 4. Further information needed

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Response Counter

10

11

[Quiz] At 25 °C, 0.10 mol each of a weak acid HA and a strong acid HB, and 0.20 mol of OH^- are combined in 1.0 L of water. The pH of the solution is ...

25% 1. < 7
25% 2. = 7
25% 3. > 7
25% 4. Further information needed

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Response Counter

10

12

Revised initial method for strong acid

An acid, HA, has $K_a = 1 \times 10^5$. Calculate the molarity of unreacted HA(aq) in a 0.02 M solution of HA.

$[H_3O^+] = ?$

$[A^-] = ?$

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Revised initial method for strong acid

An acid, HA, has $K_a = 1 \times 10^5$. Calculate the molarity of unreacted HA(aq) in a 0.02 M solution of HA.

$[H_3O^+] = 0.02$

$[A^-] = 0.02$

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Revised initial method for strong acid

An acid, HA, has $K_a = 1 \times 10^5$. Calculate the molarity of unreacted HA(aq) in a 0.02 M solution of HA.

$[H_3O^+] = 0.02$

$[A^-] = 0.02$

$[HA] = ?$

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