

[TP] At 25 °C, K_{sp} of CaF_2 is 3.9×10^{-11} . What is the maximum number of moles of CaF_2 that can dissolve in water at 25 °C?

17% 1. 0.002
17% 2. 0.01
17% 3. 0.0002
17% 4. 0.001
17% 5. 0.00002
17% 6. 0.0001

Response Counter

10

Lecture 20 CH102 A2 (MWF 11:15 am)

Wednesday, March 14, 2018

- Complete: How much strong acid remains unreacted?
- $[H_3O^+]$ when different amounts of “not enough” base added

Next lecture: Complete ch15: Five kinds of solubility equilibria problems; Practice with solubility equilibria; Begin ch16: Electron transfer reactions and electrochemistry.

Revised initial method for strong acid

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

$[H_3O^+] = 0.02$

$[A^-] = 0.02$

$[HA] = ?$

Revised initial method for strong acid

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

$[H_3O^+] = 0.02$

$[A^-] = 0.02$

$[HA] = 4 \times 10^{-9}$

Different amounts of "not enough" base

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Different amounts of "not enough" base

Say 0.02 mol of OH^- is added to 0.10 mol of weak acid HA.

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Different amounts of "not enough" base

Then an additional 0.01 mol of OH^- is added.

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Different amounts of "not enough" base

Then 0.04 mol of HCl (a strong acid) is added.

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Different amounts of “not enough” base

Carry out step 1 by “going back to the beginning”:

0.10 mol of weak acid HA + 0.03 mol of OH^- + 0.04 mol HCl 0.10

$HCl + OH^- \longrightarrow H_2O + Cl^-$

0.04 0.03 0

0.01 0 0.03

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Different amounts of “not enough” base

Carry out step 1 by “going back to the beginning”:

0.10 mol of weak acid HA + 0.03 mol of OH^- + 0.04 mol HCl 0.10

$HA + OH^- \longrightarrow H_2O + A^-$

0.10 0.03 0

0.07 0 0.03

$HCl + A^- \longrightarrow HA + Cl^-$

0.04 0.03 0.07 0

0.01 0 0.10

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Different amounts of “not enough” base

At 25 °C, the pH of a 1.0 L solution of $c_a = c_b = 1.00$ M, $K_a = 1 \times 10^{-5}$ is …

pH = 5.00

Add 100. mL of 0.100 M NaOH …

HA → 1.00 mol – 0.010 mol = 0.99 mol

A^- → 1.00 mol + 0.010 mol = 1.01 mol

↓$HA(aq) + OH^-(aq) \rightarrow H_2O(l) +$ ↑$A^-(aq)$

The pH of a 1.0 L solution of c_a = 0.99 mol/1.10 L, c_b = 1.01 mol/1.10 L is …

c_a/c_b = 1.00 → 0.99/1.01, pH → 5.01 (tiny change!)

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