Chemistry 1B, Fall 2015 Quiz #3A KEY

You must show your work for full credit.

Exp 7 Question

1. Silver nitrate is added to an unknown anion and a precipitant forms. This precipitant redissolves through the addition of HNO_3. Which of the following could the unknown ion be? (1pt)

a) Cl^- b) I^-

c) NO_3^- **d) PO_4^{3-}**

Net ionic equations related to Exp 7

2. Write a **net ionic equation** for the reaction occurring through the treatment of solid silver chloride with aqueous ammonia. (1pt).

$AgCl(s) + 2NH_3(aq) \leftrightarrow Ag(NH_3)_2^+(aq) + Cl^-(aq)$

3. Write a **net ionic equation** for the reaction of the basic anion, CO_3^{2-} , with water. Don't forget state symbols (1pt).

$CO_3^{2-}(aq) + H_2O(l) \leftrightarrow HCO_3^-(aq) + OH^-(aq)$ (note: as long it is balanced, it also could go to $H_2CO_3(aq)$ or $H_2O(l) + CO_2(g)$)

Acid/Base problems

4. For aqueous solutions made out of the following compounds, identify them as being strong acids, weak acids, neutral, weak bases, or strong bases. (0.5 pts each)

Compound	Classification
$Ca(OH)_2$	strong base
NH_4Cl	weak acid
KNO_3	neutral
$FeCl_3$	weak acid

5. What is the pH (to 4 sig fig) of a 0.0015 M solution of barium hydroxide (**2pts**)?

$K_w = 1.0 \times 10^{-14}$

$Ba(OH)_2$ is a strong base and fully dissociates

Reaction: $Ba(OH)_2(aq) \leftrightarrow Ba^{2+}(aq) + 2OH^-(aq)$

$[OH^-] = 2(0.0015\ M) = 0.0030M$ $[H^+] = K_w/[OH^-] = 1.0 \times 10^{-14}/0.0030 = 3.33 \times 10^{-12}\ M$

$pH = -\log[H^+] =$ ***11.48***

One more on back…

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Determining the pH of a solution containing a weak acid

6. 2-nitrophenol, $HC_6H_5NO_3$, is a weak acid with $K_a = 7.10 \times 10^{-8}$. Determine the pH (to 3 sig fig) of a solution initially made to be 0.0080 M 2-nitrophenol. You must show your work for full credit. If you make any simplifying assumptions, show and validate them.

In case needed, the quadratic equation for $ax^2 + bx + c = 0$ is $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$ (3 pts)

Since we are given an intial concentration, we need to make an ICE table:

Reaction:	$HC_6H_5NO_3(aq) \leftrightarrow$	$H^+(aq)$ +	$C_6H_5NO_3^-(aq)$
I	*0.0080*	*0*	*0*
C	*-x*	*+x*	*+x*
E	*0.0080 – x*	*x*	*x*

$K_a = 7.10 \times 10^{-8} = [H^+][C_6H_5NO_3^-]/[HC_6H_5NO_3(aq)] = x^2/(0.0080 - x)$
assuming $x << 0.0080$, $x^2 = (7.10 \times 10^{-8})(0.0080)$ or $x = (5.68 \times 10^{-10})^{0.5} = 2.38 \times 10^{-5}$ M $= [H^+]$
this is less than 1% of 0.0080 so our assumption is good
$pH = -\log[H^+] = -\log(2.38 \times 10^{-5}) =$ ***4.62***