Chem 1062

Note Title 7/22/2008

* I plan to have exams graded and returned to you by class tomorrow, but will make no promises. Scores will be posted to D2L if completed early enough.

* D2L Quizzes – due Tues, July 29 @ 2 am
  Ch. 16, 17, 18

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* see p. 668 for a table of acid/base strengths
  stronger acid – more likely to donate a proton
  stonger base – " " " accept " "

SA SB WA WB

$$HCl_{(aq)} + H_2O_{(l)} \rightarrow H_3O^+_{(aq)} + Cl^-_{(aq)}$$

WB WA SA SB

$$NH_{3(aq)} + H_2O_{(l)} \rightleftharpoons NH_4^+{}_{(aq)} + OH^-_{(aq)}$$

Without consulting the text and given that the reactant side is favored, identify the strongest base in the following equilibrium. Check your answer with the table on p. 668 when you are finished.

WA WB SA SB

$$H_2CO_{3(aq)} + SO_4^{2-}{}_{(aq)} \rightleftharpoons HSO_4^-{}_{(aq)} + HCO_3^-{}_{(aq)}$$

Molecular Structure & Acid Strength
(pp 670-73)

1) Size of the atom to which H is bonded
2) electronegativity of the atom to which H is bond

$$H_3PO_4 > H_2PO_4^- > HPO_4^{2-}$$

H_2SO_4 H_3PO_4

Acid-Base Theory

1. Arrehnius
2. Bronstad-Lowry
3. Lewis

Lewis Theory

acid - electron-pair acceptor

base - electron pair donor

Self-ionization of water

$$H_2O(l) + H_2O(l) \rightleftharpoons \underset{x}{H_3O^+_{(aq)}} + \underset{x}{OH^-_{(aq)}}$$

$$K_w = [H_3O^+][OH^-] = 1.0\times10^{-14} \text{ @25°C}$$

self-ionization constant of water

$$\sqrt{1.0\times10^{-14}} = \sqrt{x^2} = x = 1.0\times10^{-7} M = [H_3O^+] = [OH^-]$$

$pH = -\log[H_3O^+]$

$pH = -\log(1.0\times10^{-7}) = \boxed{7.00}$

$pH = -\log[H^+]$ used to be defined

$pOH = -\log[OH^-] \Rightarrow pOH = -\log(1.0\times10^{-7}) = \boxed{7.00}$

$pH + pOH = 14.00$ @ 25°C

$K_w = 1.0\times10^{-14}$

a solution has $[H_3O^+] = 5.4\times10^{-3}\,M$

$pH = -\log(5.4\times10^{-3}) = \boxed{2.27}$

$[H_3O^+] = 5.4\times10^{-4}\,M \Rightarrow \boxed{pH = 3.27}$

$[H_3O^+] = 5.\underline{4}\times10^{-5}\,M \Rightarrow \boxed{pH = 4.2\underline{7}}$

$[H_3O^+] = 5.\underline{5}\times10^{-5}\,M \Rightarrow \boxed{pH = 4.2\underline{6}}$

$[H_3O^+] = 5.\underline{3}\times10^{-5}\,M \Rightarrow \boxed{pH = 4.2\underline{8}}$