

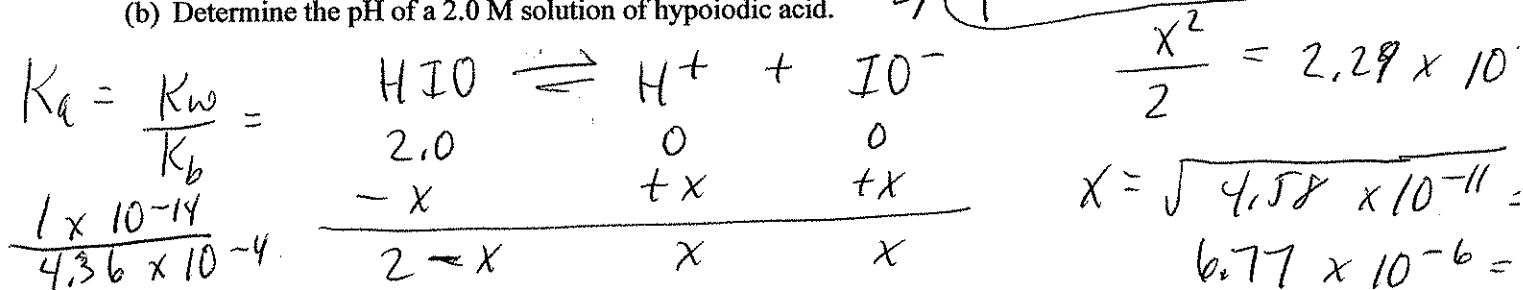
Last Name _____ First Name _____
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1) The pK_b of hypiodite ion, IO^- , is 3.36.

(a) Determine the K_b of the hypiodite ion.

$$K_b = 10^{-3.36} = \boxed{4.36 \times 10^{-4}} \quad a)$$

(b) Determine the pH of a 2.0 M solution of hypiodic acid.



2) 0.41 g of sulfurous acid, H_2SO_3 , is added to enough water to make 30. mL. If the pK_a of the acid is 1.82, the pH of the resulting solution is? [at. Mass of H = 1.008, S = 32.07, O = 16.000]

$$0.41 \text{ g } H_2SO_3 \times \frac{1 \text{ mol}}{82.076 \text{ g}} = 0.00499 \text{ mol}$$

$$\frac{0.00499 \text{ mol}}{0.030 \text{ L}} = 0.1665 \text{ M } H_2SO_3$$

$$K_a = 10^{-1.82} = 1.51 \times 10^{-2}$$

$$\frac{x^2}{0.1665 - x} = 0.0151$$

need to use quadratic \rightarrow

$$\boxed{pH = 1.36}$$

3) Calculate the pH of a 0.024 M aqueous solution of nitrous acid (HNO_2 , $K_a = 4.5 \times 10^{-4}$).

see Key

$$x = \frac{-K_a + \sqrt{(K_a)^2 + 4K_a C}}{2}$$

$$x = \frac{-0.0151 + \sqrt{(0.0151)^2 + 4(0.0151)(0.1665)}}{2}$$

$$x = 0.04316 = [H^+]$$

$$\textcircled{2} \frac{x^2}{.1665 - x} = .0151$$

$$2.514 \times 10^{-3} - .0151/x = x^2$$

$$x^2 + .0151/x - 2.514 \times 10^{-3} = 0$$

$$- .0151 \pm \sqrt{2.2801 \times 10^{-4} + .010056} = \sqrt{.01028401}$$

$$\frac{- .0151 \pm \sqrt{(.0151)^2 - 4(1)(-2.514 \times 10^{-3})}}{2} > .1014/0.08$$

$$+ .04316$$

- .05826 - extraneous root

$$x = .04316 = [H^+]$$

$$pH = -\log(.04316) = \textcircled{1.36}$$

Discussion 7 - Dr. Nalleyway
(J - Dr. WG-J)

#3 (not on Dr. WG-J sheet)

$$\text{pH} = 2.51$$
$$x = .00307$$

$$\frac{x^2}{.024 - x} = .00045$$

$$x^2 = 1.08 \times 10^{-5}$$

$$x = .00329$$

$$\frac{.00329}{.024} \times 100 = 13.7\%$$

violates 5% rule

must solve using quadratic
+ cannot neglect the $(-x)$ part

$$1.08 \times 10^{-5} - .00045x = x^2$$

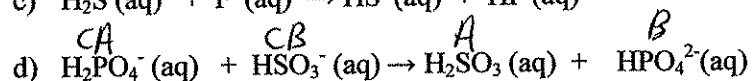
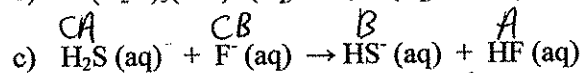
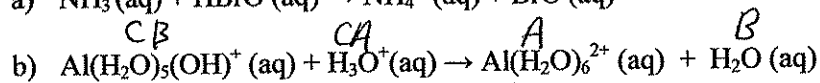
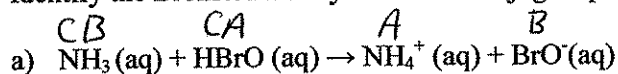
$$x^2 + .00045x - 1.08 \times 10^{-5} = 0$$

$$\frac{2.04 \times 10^{-7} + 4.32 \times 10^{-7}}{2(1)} \pm \sqrt{(.00045)^2 - 4(1)(-1.08 \times 10^{-5})}$$
$$6.59 \times 10^{-3}$$

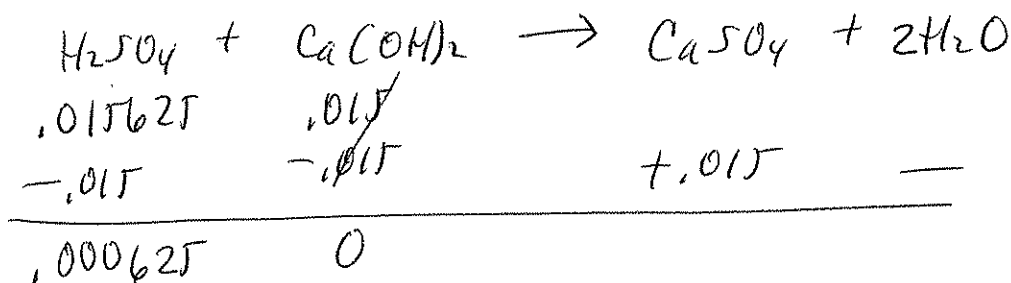
$$\frac{3.07 \times 10^{-3}}{-3.52 \times 10^{-3}}$$

invalid

4) Identify the Bronsted Lowry acid base conjugate pairs in the reverse direction of the following reactions:



5) 125 mL of 0.125 M sulfuric acid is added to 50 mL of 0.300 M calcium hydroxide solution. What is the final pH?



$$.125 \text{ L} \times \frac{.125 \text{ mol}}{\text{L}} = .015625 \text{ mol H}_2\text{SO}_4$$

$$.050 \text{ L} \times \frac{.3 \text{ mol}}{\text{L}} = .015 \text{ mol Ca}(\text{OH})_2$$

$$\text{excess moles acid} = \frac{.000625 \text{ mol}}{.175 \text{ L}} = 3.57 \times 10^{-3} \text{ M H}^+$$

$$\text{pH} = -\log(\text{H}^+) = 2.45$$