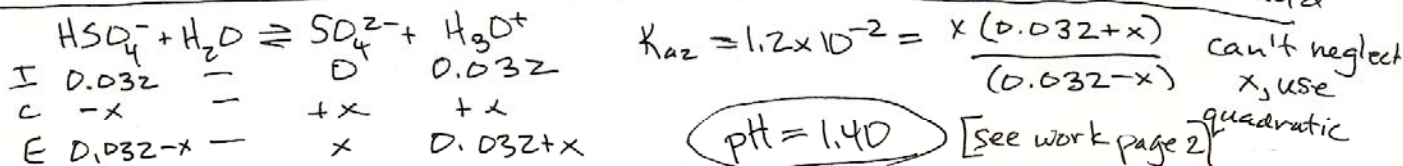


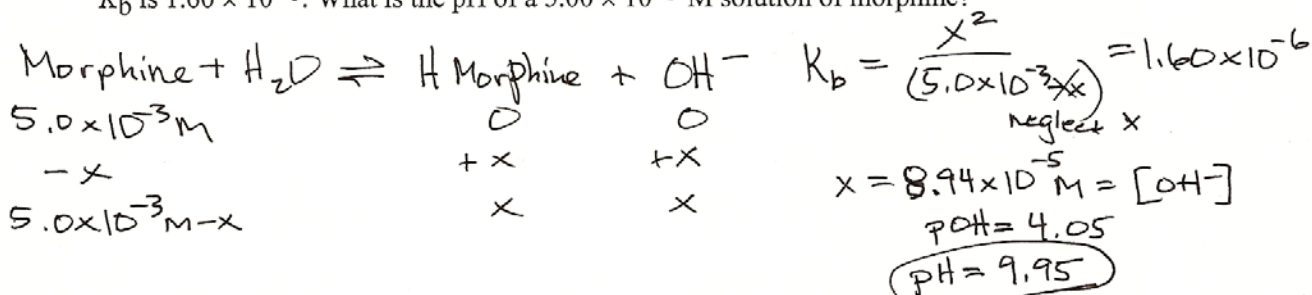
Practice Worksheet for Chemistry 1B, Exam II Name: Key

1. Determine the pH of a 0.032 M solution of H_2SO_4 . The dissociation occurs in two steps. K_{a1} is extremely large; K_{a2} is 1.2×10^{-2} .

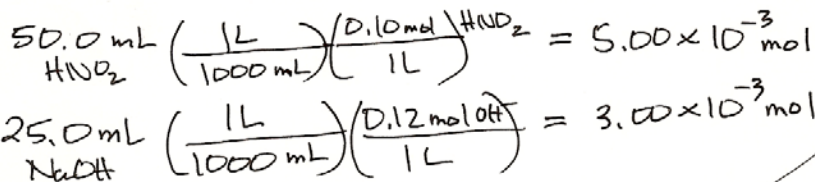
H_2SO_4 is a strong acid, so $[H_2SO_4]_i = [H_3O^+] = [HSO_4^-] = 0.032 M$
after dissociation
weak acid



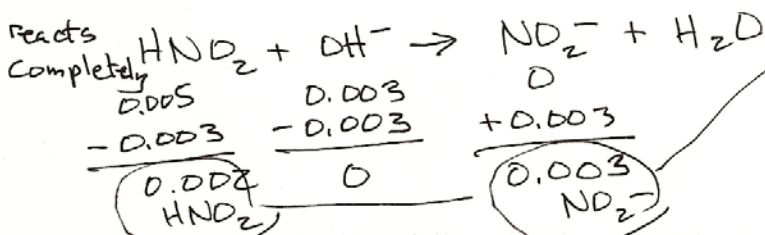
2. The pain killer morphine is a weak base when added to water. The reaction produces one mole of hydroxide ions for every one mole of morphine that reacts with water. The K_b is 1.60×10^{-6} . What is the pH of a $5.00 \times 10^{-3} M$ solution of morphine?



3. A 50.0-mL sample of 0.10 M HNO_2 ($K_a = 4.0 \times 10^{-4}$) is titrated with 0.12 M NaOH. What is the pH after 25.0 mL of NaOH have been added?

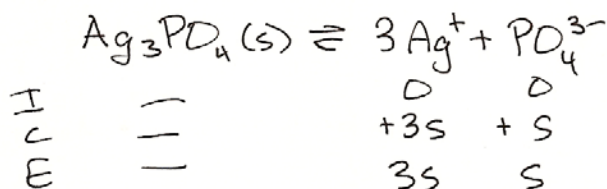


→ Buffer! Use H-H
 $pK_a = -\log K_a = 3.4$



$pH = pK_a + \log \frac{[A^-]}{[HA]}$
 $= 3.4 + \log \frac{(0.003)}{0.002}$
pH = 3.6

4. The solubility of silver phosphate, Ag_3PO_4 , at 25°C is $1.61 \times 10^{-5} mol/L$. Determine the concentration of the Ag^+ ion in a saturated solution.



$K_{sp} = (3s)^3 s = 27s^4 = 1.61 \times 10^{-5}$
 $s^4 = 5.96 \times 10^{-7}$
 $s = 0.0278 M$

$[Ag^+] = 3s = 0.0834 M$

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Using quadratic (see also section 14.17 in text)

$$1.2 \times 10^{-2} = \frac{x(0.032+x)}{(0.032-x)}$$

$$(1.2 \times 10^{-2})(0.032-x) = x(0.032+x)$$

$$0.000384 - 0.012x = 0.032x + x^2$$

$$0 = x^2 + 0.044x + 0.000384$$

use quadratic:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-0.044 \pm \sqrt{(0.044)^2 + 4(0.000384)}}{2(1)}$$

$$= \frac{-0.044 \pm 0.0589}{2} \quad (\text{only positive solution is possible})$$

$$x = 0.00746$$

$$[\text{H}_3\text{O}^+] = 0.032 + x = 0.032 + 0.00746 = 0.0395 \text{ M}$$

(from ICE table)

$$\text{pH} = -\log [\text{H}_3\text{O}^+] = -\log(0.0395) = 1.40$$