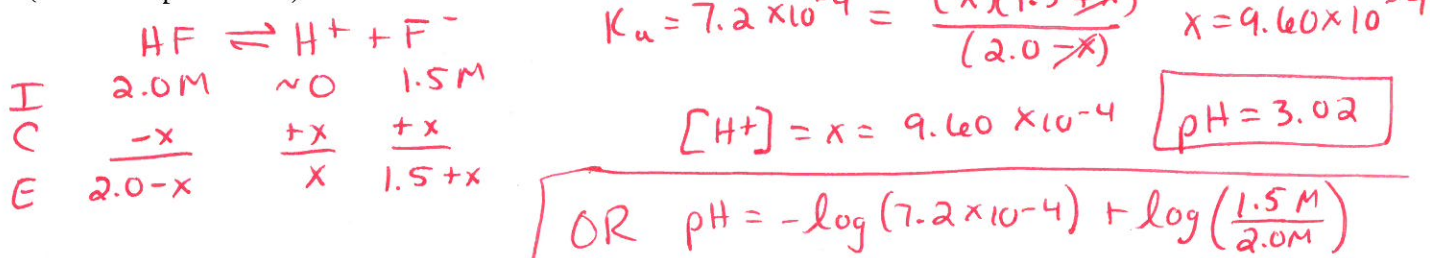
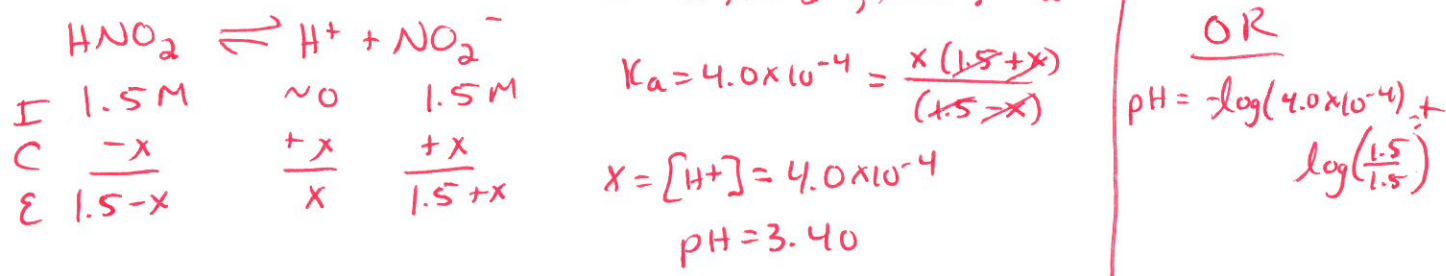


AP Chemistry Review: Chapter 15

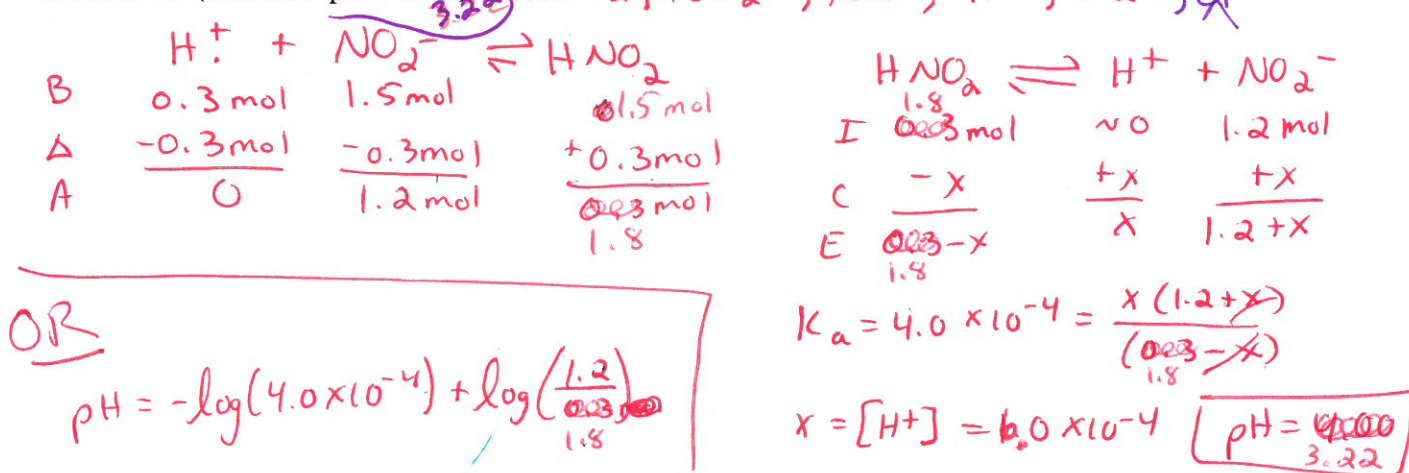
1. Calculate the pH of a solution of 2.0 M HF when 1.5 M KF is added to it. (K_a for HF = 7.2×10^{-4})
 (Answer: pH = 3.02)



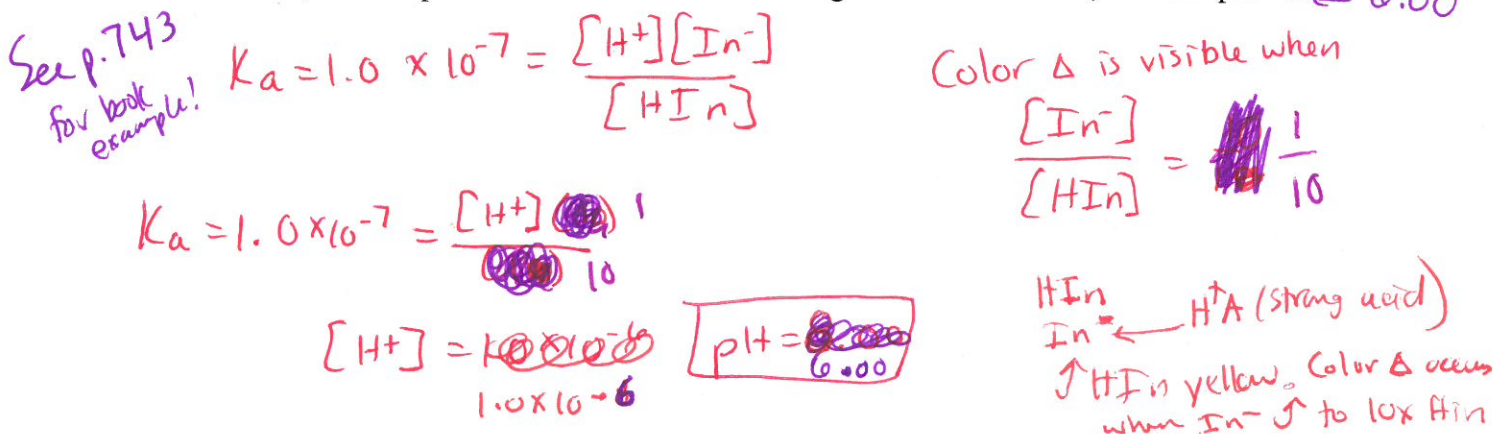
2. Calculate the pH of a buffered solution that is made by adding 1.5 M HNO₂ and 1.5 M NaNO₂. (K_a for HNO₂ is 4.0×10^{-4}) (Answer: pH = 3.40)



3. How would the pH in number two change if 0.30 mol of HCl is added to 1.0 L of the solution in number 2? (Answer: pH = 3.22)

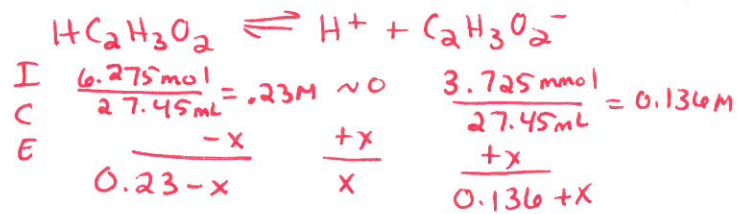
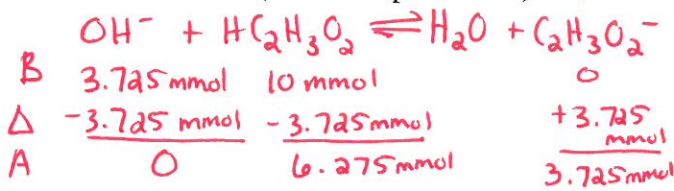


4. Bromthymol blue, an indicator with a K_a value of 1.0×10^{-7} , is yellow in its HIn form and blue in its In⁻ form. Suppose we put a few drops of this indicator in a strongly acidic solution. If the solution is then titrated with NaOH, at what pH will the indicator color change first be visible? (Answer: pH = 6.00)



5. In the titration of 20.00 mL of 0.500 M CH₃COOH with 0.500 M NaOH. (K_a for acetic acid is 1.8 x 10⁻⁵).

a. Calculate the pH at the point in the titration where 7.45 mL of 0.500 M NaOH has been added. (Answer: pH = 4.52) (7.45 mL)(0.500 M) = 3.725 mmol OH⁻

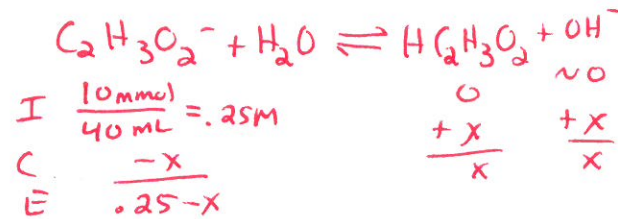
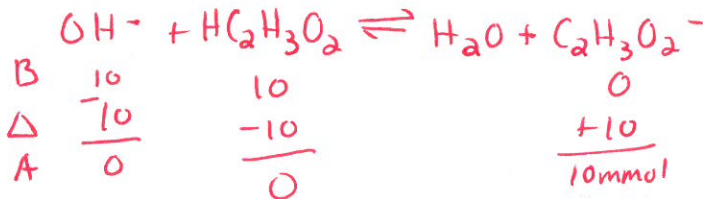


$$K_a = 1.8 \times 10^{-5} = \frac{x(0.136+x)}{(0.23-x)} \quad x = 3.04 \times 10^{-5}$$

pH = 4.52 [H⁺]

b. Calculate the pH at the point in the titration where 20.00 mL of NaOH has been added.

(Answer: pH = 9.07) (20.0 mL)(0.500 M) = 10 mmol OH⁻ Equiv. pt!



$$K_b = \frac{K_w}{K_a} = 5.6 \times 10^{-10} = \frac{x^2}{0.25-x} \quad x = 1.18 \times 10^{-5}$$

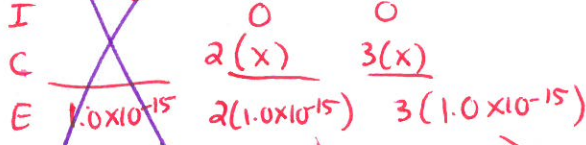
pOH = 4.93
pH = 9.07

6. Calculate the K_{sp} value for bismuth sulfide (Bi₂S₃), which has a solubility of 1.0 x 10⁻¹⁵ mol/L at 25°C.

(Answer: K_{sp} = 1.1 x 10⁻⁷³)



$$K_{sp} = [\text{Bi}^{3+}]^2 [\text{S}^{2-}]^3$$

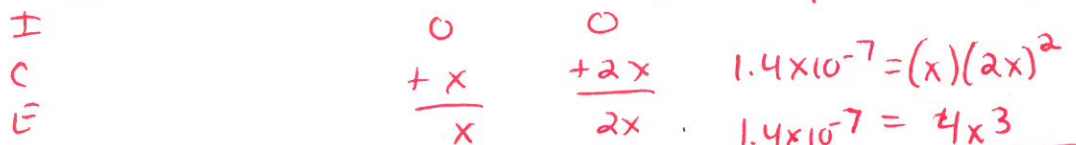
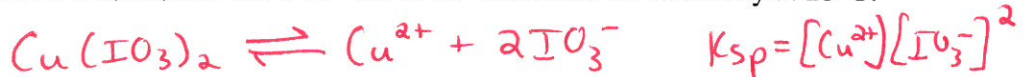


$$K_{sp} = (2.0 \times 10^{-15})^2 (3.0 \times 10^{-15})^3$$

K_{sp} = 1.1 x 10⁻⁷³

7. The K_{sp} value for copper (II) iodate, Cu(IO₃)₂, is 1.4 x 10⁻⁷ at 25°C. Calculate its solubility at 25°C.

(Answer: 3.3 x 10⁻³ mol/L)



$$1.4 \times 10^{-7} = (x)(2x)^2$$

$$1.4 \times 10^{-7} = 4x^3$$

x = 3.3 x 10⁻³ mol/L

8. Write equations for the stepwise formation of the following complex ion: Co(NH₃)₆²⁺

