

## Chem 2 AP Homework #4-5: Acid Base and Redox Titrations

(Take from book, Problems pg. 155 #82, 83, 84, 86, 88, 90, 92, 94, 96)

4.82 Why does an acid-base indicator change color when the pH changes? (What happens to molecule? )

4.83 A student carried out two titrations to standardize a NaOH solution of unknown concentration by titrating the NaOH with KHP (potassium hydrogen phthalate-an acid). She titrated the NaOH with two similar masses of KHP but one time the KHP was dissolved in 20.00 mL of distilled water and the other time the KHP was dissolved in 40.00 mL of water. Assuming no experimental error, would she obtain the same result for the concentration of the NaOH solution both times?

4.84 Would the volume of a 0.20 M NaOH solution needed to titrate 25.0 mL of a 0.10 M HNO<sub>2</sub> (a weak acid) solution to its equivalence point be different from the volume of NaOH needed to titrate 25.0 mL of a 0.10 M HCl (a strong acid) solution? The data is organized for you below:

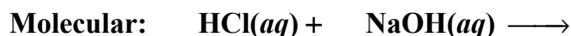


4.86 Calculate the concentration (in molarity) of a NaOH solution if 25.0 mL of the solution are needed to neutralize 17.4 mL of a 0.312 M HCl solution.

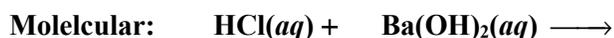


4.88 What volume of a 0.500 M HCl solution is needed to neutralize each of the following?

(a) 10.0 mL of a 0.300 M NaOH solution



(b) 10.0 mL of a 0.200 M Ba(OH)<sub>2</sub> solution



4.90 Explain why potassium permanganate ( $\text{KMnO}_4$ ) and potassium dichromate ( $\text{K}_2\text{Cr}_2\text{O}_7$ ) can serve as internal indicators in redox titrations.

4.92 The  $\text{SO}_2$  present in air is mainly responsible for the acid rain phenomenon. Its concentration can be determined by titrating against a standard permanganate solution as follows.



Calculate the number of grams of  $\text{SO}_2$  in a sample of air if 7.37 mL of 0.00800 M  $\text{KMnO}_4$  solution are required for the titration.

4.94 The concentration of a hydrogen peroxide solution can be conveniently determined by titration against a standardized potassium permanganate solution in an acidic medium according to the following equation:



If 36.44 mL of a 0.01652 M  $\text{KMnO}_4$  solution are required to oxidize 25.00 mL of a  $\text{H}_2\text{O}_2$  solution, calculate the molarity of the  $\text{H}_2\text{O}_2$  solution.

4.96 Oxalic acid ( $\text{H}_2\text{C}_2\text{O}_4$ ) is present in many plants and vegetables. If 24.0 mL of 0.0100 M  $\text{KMnO}_4$  solution is needed to titrate 1.00 g of a sample of  $\text{H}_2\text{C}_2\text{O}_4$  (oxalic acid) to the equivalence point, what is the percent by mass of  $\text{H}_2\text{C}_2\text{O}_4$  in the sample?

