/50

AP Chemistry – Buffers, Titration, Solubility – 61

Name _____Per ___

1. Calculate the pH of a buffer that is 0.100 M $NaHCO_3$, $K_a = 5.6 \times 10^{-11}$, and 0.125 M Na_2CO_3.

2. Calculate the pH of a solution formed by mixing 55 mL of 0.20 M $NaHCO_3$ with 65 mL of 0.15 M Na_2CO_3.

3. How many grams of sodium lactate, $NaC_3H_5O_3$ should be added to 1.00 L of 0.150 M lactic acid, $HC_3H_5O_3$, $K_a = 1.4 \times 10^{-4}$, to form a buffer solution with pH 2.90? Assume that no volume change occurs when the sodium lactate is added.

4. How many milliliters of 0.105 M HCl are needed to titrate each of the following solutions to the equivalence point:
(a) 55.0 mL of 0.0950 M NaOH

(b) 23.5 mL of 0.117 M KOH

(c) 125.0 mL of a solution that contains 1.35 g of NaOH per liter

5. Consider the titration of 30.0 mL of 0.030 M $NH_{3(aq)}$, $K_b = 1.8 \times 10^{-5}$, with 0.025 M HCl. (a) Calculate the pH of the NH_3 before titration.

(b) Calculate the pH after 10.0 mL of HCl has been added.

6. The molar solubility of $PbBr_2$ at $25^{\circ C}$ is 1.0×10^{-2} moles/L. Calculate K_{sp}.

7. If 0.0490 g of $AgIO_3$ dissolves per liter of solution, what would be the value of K_{sp}?

8. Calculate the solubility of LaF_3 in g/L in pure water. The K_{sp} of $LaF_3 = 2 \times 10^{-19}$.

9. Consider the reaction of ozone with nitrogen monoxide: $O_{3(g)} + NO_{(g)} \rightarrow O_{2(g)} + NO_{2(g)}$. (a) Calculate the standard enthalpy change.

(b) Based on the reaction alone, make a prediction of the standard entropy change. Explain.

(c) Based on your answers from parts (a) and (b) what do you think the sign of the standard free-energy change will be? Explain.

(d) Using the information in the table below, write the rate-law for the reaction. Explain how you determined the rate-law.

Experiment	Initial [O_3] M	Initial [NO] M	Initial Rate M/s
1	0.0010	0.0010	0.163
2	0.0010	0.0020	0.326
3	0.0020	0.0010	0.326
4	0.0020	0.0020	0.652

(e) Here are the three steps of the proposed mechanism for the reaction:
Step 1: $O_3 + NO \rightarrow O + NO_3$
Step 2: $O + O_3 \rightarrow 2\ O_2$
Step 3: $NO_3 + NO \rightarrow 2NO_2$
Which step is the rate determining step which is consistent with the rate law from part (d)? Explain.