

Week 5 Worksheet

Chem 11200-2: Section 33

Feb. 8, 2022

Problem 1: Imagine you titrate 150 mL of a 0.250 M $\text{HC}_2\text{H}_3\text{O}_2$ solution with a 0.75 M $\text{Sr}(\text{OH})_2$ solution. At which of the following points during your titration will a buffer system be present?

1. 0 mL of base added
2. 12.5 mL of base added
3. 25 mL of base added
4. 37.5 mL of base added
5. 50 mL of base added

Problem 2: What volume of 0.125 M NaOH must be added to 365 mL of 0.275 M HCHO_2 to attain a solution with a pH of 3.50? (the pK_a of HCHO_2 is 3.74)

The following problems are written by Professor Mcleod or Head TA Miah Turke. They may mimic homework problems closely, but will be highly beneficial for the midterms and final.

Problem 3: Consider a 500. mL solution of hypochlorous acid (HClO) with a pH of 3.94. What is the pH of this solution after adding 60.0 mL of 5.00 M NaOH? Assume the solutions behave ideally $\text{pK}_a(\text{HClO}) = 7.53$.

Problem 4: Acetic acid (CH_3COOH) is a weak monoprotic acid with $\text{pK}_a = 4.75$. Its MW is 60.06 g/mol and the MW of NaCH_3COO is 82.03 g/mol.

- a) What is the pH of a solution of 0.685 g NaCH_3COO in 50.0 mL of water?
- b) What would the pH be if you added 0.485 g CH_3COOH to the mixture from part a?
- c) How many mL of 0.750 M HCl would you need to add to the solution from part a to get the same pH you got from part b?

Problem 5:

- a) Without doing any calculations, draw a titration curve for a diprotic weak acid, H_2A being titrated with NaOH. Label the x and y axis, the buffer regions, and the equivalence points.
- b) How are buffers made over the course of a titration like this one (how much base do you need to add)? How do you know how many buffer regions you will have?

- c) Explain what the equivalence point is. How do you know how many equivalence points you are going to have?
- d) How would the titration curve look if you started with A^{2-} and titrated using HCl? Draw a quick sketch and explain the differences from part a. Do the number of buffer regions and equivalence points change?