

ALL work must be shown to receive full credit. **Due at the beginning of class on Wednesday, November 21, 2001.**

PS13.1. Determine the pH for a solution containing the following substances[†].

a) 0.550 M $\text{HC}_4\text{H}_7\text{O}_2$ and 0.550 M $\text{NaC}_4\text{H}_7\text{O}_2$

b) 0.460 M $\text{HC}_4\text{H}_7\text{O}_2$ and 0.460 M $\text{NaC}_4\text{H}_7\text{O}_2$

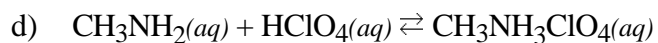
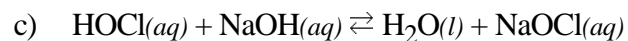
c) 0.300 M NH_4Cl and 0.520 M NH_3

[†] Important equilibrium constants are located in the Table available on the class Web Site.

d) 0.300 M HCl and 0.890 M HC₃H₅O₂

e) 0.375 M C₆H₅NH₃NO₃ and 0.565 M C₆H₅NH₂

PS13.2. Determine the magnitude of the equilibrium constant for the following reactions



PS13.3. A titration is performed by adding 0.250 M KOH to 25.0 mL of 0.350 M HNO₃.

- a) Calculate the pH before addition of any KOH.
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- b) Calculate the pH after the addition of 4.0, 18.0 and 34.0 mL of the base.(Show your work in detail for one of the volumes.)

- c) Calculate the volume of base needed to reach the equivalence point.
- d) Calculate the pH at the equivalence point.
- e) Calculate the pH after adding 5.00 mL of KOH past the endpoint.
- f) Plot pH (y axis) versus volume of KOH added (x axis) for each calculation above. Sketch the titration curve.



- PS13.4. A titration is performed by adding 0.200 M NaOH to 30.0 mL of 0.275 M $\text{HC}_3\text{H}_5\text{O}_2$.
- a) Calculate the pH before addition of any NaOH.

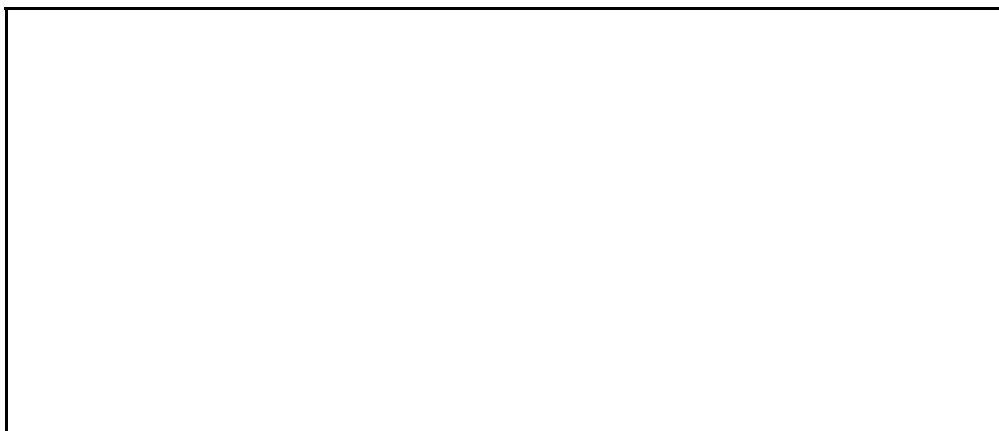
- b) Calculate the pH after the addition of 1.5, 20.0, and 40.5 mL of the base. (Show your work in detail for one of the volumes.)

c) Calculate the volume of base needed to reach the equivalence point.

d) Calculate the pH at the equivalence point.

e) Calculate the pH after adding 5.00 mL of NaOH past the endpoint.

f) Plot pH (y axis) versus volume of NaOH added (x axis) for each calculation above. Sketch the titration curve.



PS13.5. Calculate the pH at the equivalence point when 35.0 mL of 0.160 M ethylamine, $\text{CH}_3\text{CH}_2\text{NH}_2$, is titrated with 0.120 M HBr

PS13.6. Calculate the pH of a solution prepared by mixing
a) 25.0 mL of 0.512 M NaOH and 34.0 mL of 0.187 M HCl

PS13.6. (CONTINUED)

b) 46.0 mL of 0.235 M KOH and 50.0 mL of 0.420 M $\text{HC}_3\text{H}_5\text{O}_2$

c) 400 mL of 0.250 M NH_3 and 250 mL of 0.120 M HCl