Acids Practice Test 2

1. What colour would 1.0 M HCl be in an indicator mixture consisting of phenol red and thymolphthalein?
   
   A red  
   B blue  
   C yellow  
   D colourless

2. During a titration, what volume of 0.500 M KOH is necessary to completely neutralize 10.0 mL of 2.00 M CH₃COOH?
   
   A 10.0 mL  
   B 20.0 mL  
   C 25.0 mL  
   D 40.0 mL

3. Which indicator has a Ka = 1.0 x 10⁻⁶?
   
   A neutral red  
   B thymol blue  
   C thymolphthalein  
   D chlorophenol red

4. Acid is added to a buffer solution. When equilibrium is reestablished the buffering effect has resulted in [H₃O⁺]
   
   A increasing slightly  
   B decreasing slightly  
   C increasing considerably  
   D decreasing considerably

5. A buffer solution will form when 0.10 M NaF is mixed with an equal volume of
   
   A 0.10 M HF  
   B 0.10 M HCl  
   C 0.10 M NaCl  
   D 0.10 M NaOH
6. Which of the following statements applies to 1.0 M NH$_3$(aq) but not to 1.0 M NaOH$_{(aq)}$?
   A partially ionizes  
   B neutralizes an acid  
   C has a pH greater than 7  
   D turns bromocresol green from yellow to blue

7. In which of the following are the reactants favoured?
   A HNO$_2$ + CN$^-$ $\rightleftharpoons$ NO$_2^-$ + HCN  
   B H$_2$S + HCO$_3^-$ $\rightleftharpoons$ HS$^-$ + H$_2$CO$_3$  
   C H$_3$PO$_4$ + NH$_3$ $\rightleftharpoons$ H$_2$PO$_4^-$ + NH$_4^+$  
   D CH$_3$COOH + PO$_4^{3-}$ $\rightleftharpoons$ CH$_3$COO$^-$ + HPO$_4^{2-}$

8. What is the pOH of a solution prepared by adding 0.50 moles of NaOH to prepare 0.50 L of solution?
   A 0.00  
   B 0.30  
   C 14.00  
   D 13.70

9. What is the [H$_3$O$^+$] in a solution with a pH = 5.20?
   A $1.4 \times 10^{-14}$  
   B $1.6 \times 10^{-9}$  
   C $6.3 \times 10^{-6}$  
   D $7.1 \times 10^{-1}$

10. Consider the following equilibrium: 2H$_2$O$_{(l)}$ + energy $\rightleftharpoons$ H$_3$O$_{\text{aq}}^+$ + OH$^-_{\text{aq}}$  
       What will cause the pH to increase and the Kw to decrease?
       A adding a strong acid  
       B adding a strong base  
       C increasing the temperature  
       D decreasing the temperature

11. The complete neutralization of 15.0 mL of KOH requires 0.0250 moles H$_2$SO$_4$. The [KOH] was
    A 1.50 M  
    B 1.67 M  
    C 3.33 M  
    D 6.67 M
12. What is the $[\text{H}_3\text{O}^+]$ at the equivalence point for the titration between HBr and KOH?
   A $1.0 \times 10^{-9}$ M  
   B $1.0 \times 10^{-7}$ M  
   C $1.0 \times 10^{-5}$ M  
   D 0.0 M

13. Which of the following would form a buffer solution when equal moles are mixed together?
   A HCl and NaCl  
   B HCN and NaCN  
   C KNO$_3$ and KOH  
   D Na$_2$SO$_4$ and NaOH

14. Which of the following acids has the weakest conjugate base?
   A HIO$_3$  
   B HNO$_2$  
   C H$_3$PO$_4$  
   D CH$_3$COOH

15. When 10.0 ml of 0.10 M HCl is added to 10.0 mL of water, the concentration of $\text{H}_3\text{O}^+$ in the final solution is
   A 0.010 M  
   B 0.050 M  
   C 0.10 M  
   D 0.20 M

16. The conjugate base of an acid is produced by
   A adding a proton to the acid  
   B adding an electron to the acid  
   C removing a proton from the acid  
   D removing an electron from the acid

17. Which of the following represents the predominant reaction between HCO$_3^-$ and water?
   A $2\text{HCO}_3^- \rightleftharpoons \text{H}_2\text{O} + 2\text{CO}_2$  
   B $\text{HCO}_3^- + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{CO}_3 + \text{OH}^-$  
   C $\text{HCO}_3^- + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{CO}_3^{2-}$  
   D $2\text{HCO}_3^- + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{CO}_3^{2-} + \text{OH}^- + \text{CO}_2$
18. Water acts as an acid when it reacts with

I  CN⁻  III  HClO₄
II  NH₃  IV  CH₃COO⁻

A  I and IV only
B  II and III only
C  I, II, and IV
D  II, III, and IV

19. In a solution of 0.10 M H₂SO₄, the ions present in order of decreasing concentration are

A  [H₃O⁺] > [HSO₄⁻] > [SO₄²⁻] > [OH⁻]
B  [H₃O⁺] > [SO₄²⁻] > [HSO₄⁻] > [OH⁻]
C  [OH⁻] > [SO₄²⁻] > [HSO₄⁻] > [H₃O⁺]
D  [SO₄²⁻] > [HSO₄⁻] > [OH⁻] > [H₃O⁺]

20. Which of the following will dissolve in water to produce an acidic solution?

A  CO₂
B  CaO
C  MgO
D  Na₂O

21. Which of the following solutions will have a pH = 1.00?

I  0.10 M HCl  II  0.10 M HNO₂  III  0.10 M NaOH

A  I only
B  II only
C  I and II only
D  I, II, and III

22. Ka for the acid H₂AsO₄⁻ is 5.6 x 10⁻⁸. What is the value of the Kb for HAsO₄²⁻?

A  5.6 x 10⁻²²
B  3.2 x 10⁻¹⁴
C  1.8 x 10⁻⁷
D  2.4 x 10⁻⁴

23. In a titration, which of the following has a pH = 7.00 at the equivalence point?

A  NH₃ and HNO₃
B  KOH and HCl
C  NaF and HCl
D  Ca(OH)₂ and CH₃COOH
24. Which of the following salts dissolves to produce a basic solution?

A  KCl  
B  NH₄Br  
C  Fe(NO₃)₃  
D  LiCH₃COO

25. Calculate the pH in a 0.200 M solution of Sr(OH)₂.

A  1.40  
B  1.70  
C  13.30  
D  13.60

26. Which of the following solutions has a pH less than 7.00?

A  NaCl  
B  LiOH  
C  NH₄NO₃  
D  KCH₃COO

27. Which of the following will form a basic aqueous solution?

A  HSO₃⁻  
B  HSO₄⁻  
C  HPO₄²⁻  
D  HC₂O₄⁻

28. What is the approximate Ka value for the indicator chlorophenol red?

A  1 x 10⁻¹⁴  
B  1 x 10⁻⁸  
C  1 x 10⁻⁶  
D  1 x 10⁻³

29. What is the approximate pH of the solution formed when 0.040 mol NaOH is added to 2.00 L of 0.020 M HCl?

A  0.00  
B  1.40  
C  1.70  
D  7.00
30. In which one of the following equations are the Bronsted acids and bases all correctly identified?

\[
\text{Acid} + \text{Base} \iff \text{Base} + \text{Acid}
\]

A. \( \text{H}_2\text{O}_2 \quad \text{SO}_3^{2-} \iff \text{HO}_2^- \quad \text{HSO}_3^- \)
B. \( \text{H}_2\text{O}_2 \quad \text{SO}_3^{2-} \iff \text{HSO}_3^- \quad \text{HO}_2^- \)
C. \( \text{SO}_3^{2-} \quad \text{H}_2\text{O}_2 \iff \text{HO}_2^- \quad \text{HSO}_3^- \)
D. \( \text{SO}_3^{2-} \quad \text{H}_2\text{O}_2 \iff \text{HSO}_3^- \quad \text{HO}_2^- \)

31. Which of the following titrations will always have an equivalence point at a pH > 7.00?

A. weak acid with a weak base
B. strong acid with a weak base
C. weak acid with a strong base
D. strong acid with a strong base

32. A buffer solution may contain equal moles of

A. weak acid and strong base
B. strong acid and strong base
C. weak acid and its conjugate base
D. strong acid and its conjugate base

33. A gas which is produced by burning coal and also contributes to the formation of acid rain is

A. \( \text{H}_2 \)
B. \( \text{O}_3 \)
C. \( \text{SO}_2 \)
D. \( \text{C}_3\text{H}_8 \)

34. Which of the following 1.0 M salt solutions is acidic?

A. \( \text{BaS} \)
B. \( \text{NH}_4\text{Cl} \)
C. \( \text{Ca(NO}_3)_2 \)
D. \( \text{NaCH}_3\text{COO} \)

35. Which of the following statements applies to 1.0 M \( \text{NH}_3(\text{aq}) \) but not to 1.0 M \( \text{NaOH}(\text{aq}) \)?

A. partially ionizes
B. neutralizes and acid
C. has a pH greater than 7
D. turns bromcresol green from yellow to blue
36. When the indicator thymol blue is added to 0.10 M solution of an unknown acid, the solution is red. The acid could be

A  HF  
B  H₂S  
C  HCN  
D  HNO₃

**Subjective**

1. Calculate the pH of the solution prepared by mixing 15.0 mL of 0.50 M HCl with 35.0 mL 0.50 M NaOH.

2. Calculate the [OH⁻] in 0.50 M NH₃(aq).

3. A titration was performed by adding 0.175 M H₂C₂O₄ to a 25.00 mL sample of NaOH. The following data was collected.

<table>
<thead>
<tr>
<th>Trial</th>
<th>Final volume of H₂C₂O₄ from burette (mL)</th>
<th>Initial volume of H₂C₂O₄ from burette (mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trial 1</td>
<td>23.00</td>
<td>4.85</td>
</tr>
<tr>
<td>Trial 2</td>
<td>39.05</td>
<td>23.00</td>
</tr>
<tr>
<td>Trial 3</td>
<td>20.95</td>
<td>5.00</td>
</tr>
</tbody>
</table>

Calculate the [NaOH]

4. A 250.0 mL sample of HCl with a pH of 2.000 is completely neutralized with 0.200 M NaOH. What volume of NaOH is required to reach the stoichiometric point.

5. If the HCl were titrated with 0.200 M NH₃(aq) instead of 0.200 M NaOH, how would the volume of base required to reach the equivalence point compare with the volume calculated in the last question? Explain your answer.

6. Consider the following salt ammonium acetate, NH₄CH₃COO.
   a) Write the equation for the dissociation of NH₄CH₃COO.

   b) Write the equations for the hydrolysis reactions that occur.

   c) Explain why a solution of NH₄CH₃COO has a pH =7.00. Support your answer with a calculation.

7. Consider the following equilibrium: energy + 2H₂O ⇌ H₃O⁺ + OH⁻
   a) Explain how pure water can have a pH = 7.30.

   b) Calculate the value of the Kw for the sample of water with a pH = 7.30.
Acids Practice Test 2

1. What colour would 1.0 M HCl be in an indicator mixture consisting of phenol red and thymolphthalein?
   A red
   B blue
   C yellow
   D colourless

2. During a titration, what volume of 0.500 M KOH is necessary to completely neutralize 10.0 mL of 2.00 M CH₃COOH?
   A 10.0 mL
   B 20.0 mL
   C 25.0 mL
   D 40.0 mL

3. Which indicator has a Ka = 1.0 x 10⁻⁶?
   A neutral red
   B thymol blue
   C thymolphthalein
   D chlorophenol red

4. Acid is added to a buffer solution. When equilibrium is reestablished the buffering effect has resulted in [H₃O⁺]
   A increasing slightly
   B decreasing slightly
   C increasing considerably
   D decreasing considerably

5. A buffer solution will form when 0.10 M NaF is mixed with an equal volume of
   A 0.10 M HF
   B 0.10 M HCl
   C 0.10 M NaCl
   D 0.10 M NaOH
6. Which of the following statements applies to 1.0 M NH₃(aq) but not to 1.0 M NaOH(aq)?
   A partially ionizes
   B neutralizes an acid
   C has a pH greater than 7
   D turns bromocresol green from yellow to blue

7. In which of the following are the reactants favoured?
   A \( \text{HNO}_2 + \text{CN}^- \rightleftharpoons \text{NO}_2^- + \text{HCN} \)
   B \( \text{H}_2\text{S} + \text{HCO}_3^- \rightleftharpoons \text{HS}^- + \text{H}_2\text{CO}_3 \)
   C \( \text{H}_3\text{PO}_4 + \text{NH}_3 \rightleftharpoons \text{H}_2\text{PO}_4^- + \text{NH}_4^+ \)
   D \( \text{CH}_3\text{COOH} + \text{PO}_4^{3-} \rightleftharpoons \text{CH}_3\text{COO}^- + \text{HPO}_4^{2-} \)

8. What is the pOH of a solution prepared by adding 0.50 moles of NaOH to prepare 0.50 L of solution?
   A 0.00
   B 0.30
   C 14.00
   D 13.70

9. What is the \([\text{H}_3\text{O}^+]\) in a solution with a pH = 5.20?
   A \(1.4 \times 10^{-14}\)
   B \(1.6 \times 10^{-9}\)
   C \(6.3 \times 10^{-6}\)
   D \(7.1 \times 10^{-1}\)

10. Consider the following equilibrium: \(2\text{H}_2\text{O}(l) + \text{energy} \rightleftharpoons \text{H}_3\text{O}^+ + \text{OH}^-\)
    What will cause the pH to increase and the Kw to decrease?
    A adding a strong acid
    B adding a strong base
    C increasing the temperature
    D decreasing the temperature

11. The complete neutralization of 15.0 mL of KOH requires 0.0250 moles H₂SO₄. The [KOH] was
    A 1.50 M
    B 1.67 M
    C 3.33 M
    D 6.67 M

12. What is the \([\text{H}_3\text{O}^+]\) at the equivalence point for the titration between HBr and KOH?
    A \(1.0 \times 10^{-9}\) M
    B \(1.0 \times 10^{-7}\) M
C 1.0 x 10^{-5} M
D 0.0 M

13. Which of the following would form a buffer solution when equal moles are mixed together?

A HCl and NaCl
B HCN and NaCN
C KNO_{3} and KOH
D Na_{2}SO_{4} and NaOH

14. Which of the following acids has the weakest conjugate base?

A HIO_{3}
B HNO_{2}
C H_{3}PO_{4}
D CH_{3}COOH

15. When 10.0 ml of 0.10 M HCl is added to 10.0 mL of water, the concentration of H_{3}O^{+} in the final solution is

A 0.010 M
B 0.050 M
C 0.10 M
D 0.20 M

16. The conjugate base of an acid is produced by

A adding a proton to the acid
B adding an electron to the acid
C removing a proton from the acid
D removing an electron from the acid

17. Which of the following represents the predominant reaction between HCO_{3}^{-} and water?

A 2HCO_{3}^{-} ⇄ H_{2}O + 2CO_{2}
B HCO_{3}^{-} + H_{2}O ⇄ H_{2}CO_{3} + OH^{-}
C HCO_{3}^{-} + H_{2}O ⇄ H_{3}O^{+} + CO_{3}^{2-}
D 2HCO_{3}^{-} + H_{2}O ⇄ H_{3}O^{+} + CO_{3}^{2-} + OH^{-} + CO_{2}

18. Water acts as an acid when it reacts with

I CN^{-}
II NH_{3}
III HClO_{4}
IV CH_{3}COO^{-}

A I and IV only
B II and III only
19. In a solution of 0.10 M H2SO4, the ions present in order of decreasing concentration are

A \([\text{H}_3\text{O}^+] > [\text{HSO}_4^-] > [\text{SO}_4^{2-}] > [\text{OH}^-]\)
B \([\text{H}_3\text{O}^+] > [\text{SO}_4^{2-}] > [\text{HSO}_4^-] > [\text{OH}^-]\)
C \([\text{OH}^-] > [\text{SO}_4^{2-}] > [\text{HSO}_4^-] > [\text{H}_3\text{O}^+]\)
D \([\text{SO}_4^{2-}] > [\text{HSO}_4^-] > [\text{OH}^-] > [\text{H}_3\text{O}^+]\)

20. Which of the following will dissolve in water to produce an acidic solution?

A \(\text{CO}_2\)
B \(\text{CaO}\)
C \(\text{MgO}\)
D \(\text{Na}_2\text{O}\)

21. Which of the following solutions will have a pH = 1.00?

I 0.10 M HCl
II 0.10 M HNO2
III 0.10 M NaOH

A I only
B II only
C I and II only
D I, II, and III

22. Ka for the acid H2AsO4^- is \(5.6 \times 10^{-8}\). What is the value of the Kb for HAsO4^{2-}?

A \(5.6 \times 10^{-22}\)
B \(3.2 \times 10^{14}\)
C \(1.8 \times 10^{7}\)
D \(2.4 \times 10^{-4}\)

23. In a titration, which of the following has a pH = 7.00 at the equivalence point?

A NH3 and HNO3
B KOH and HCl
C NaF and HCl
D Ca(OH)2 and CH3COOH

24. Which of the following salts dissolves to produce a basic solution?

A KCl
B NH4Br
C Fe(NO3)3
D LiCH3COO
25. Calculate the pH in a 0.200 M solution of Sr(OH)$_2$.  

A  1.40  
B  1.70  
C  12.30  
D  **13.60**

26. Which of the following solutions has a pH less than 7.00?  

A  NaCl  
B  LiOH  
C  **NH$_4$NO$_3$**  
D  KCH$_3$COO

27. Which of the following will form a basic aqueous solution?  

A  HSO$_3^-$  
B  HSO$_4^-$  
C  **HPO$_4^{2-}$**  
D  HC$_2$O$_4^-$

28. What is the approximate Ka value for the indicator chlorophenol red?  

A  1 x 10$^{-14}$  
B  1 x 10$^{-8}$  
C  **1 x 10$^{-6}$**  
D  1 x 10$^{-3}$

29. What is the approximate pH of the solution formed when 0.040 mol NaOH is added to 2.00 L of 0.020 M HCl?  

A  0.00  
B  1.40  
C  1.70  
D  **7.00**

30. In which one of the following equations are the Bronsted acids and bases all correctly identified?  

\[
\text{Acid} + \text{Base} \rightleftharpoons \text{Base} + \text{Acid}
\]

A  $\text{H}_2\text{O}_2$ + $\text{SO}_3^{2-}$ $\rightleftharpoons$ $\text{HO}_2^-$ + $\text{HSO}_3^-$  
B  $\text{H}_2\text{O}_2$ + $\text{SO}_3^{2-}$ $\rightleftharpoons$ $\text{HSO}_3^-$ + $\text{HO}_2^-$
C  \[ \text{SO}_3^{2-} + H_2O \rightleftharpoons \text{HO}_2^- + \text{HSO}_3^- \]
D  \[ \text{SO}_3^{2-} + H_2O \rightleftharpoons \text{HSO}_3^- + \text{HO}_2^- \]

31. Which of the following titrations will always have an equivalence point at a pH > 7.00?

A  weak acid with a weak base  
B  strong acid with a weak base  
C  strong acid with a strong base  
D  weak acid with a strong base

32. A buffer solution may contain equal moles of

A  weak acid and strong base  
B  strong acid and strong base  
C  weak acid and its conjugate base  
D  strong acid and its conjugate base

33. A gas which is produced by burning coal and also contributes to the formation of acid rain is

A  \( H_2 \)  
B  \( O_3 \)  
C  \( \text{SO}_2 \)  
D  \( C_3H_8 \)

34. Which of the following 1.0 M salt solutions is acidic?

A  \( \text{BaS} \)  
B  \( \text{NH}_4\text{Cl} \)  
C  \( \text{Ca(NO}_3\text{)}_2 \)  
D  \( \text{NaCH}_3\text{COO} \)

35. Which of the following statements applies to 1.0 M \( \text{NH}_3(\text{aq}) \) but not to 1.0 M \( \text{NaOH(aq)} \)?

A  partially ionizes  
B  neutralizes and acid  
C  has a pH greater than 7  
D  turns bromcresol green from yellow to blue

36. When the indicator thymol blue is added to 0.10 M solution of an unknown acid, the solution is red. The acid could be

A  \( \text{HF} \)  
B  \( \text{H}_2\text{S} \)  
C  \( \text{HCN} \)  
D  \( \text{HNO}_3 \)
Subjective

1. Calculate the pH of the solution prepared by mixing 15.0 mL of 0.50 M HCl with 35.0 mL 0.50 M NaOH.

\[
\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{HOH}
\]

\[
\begin{array}{c|c|c|c}
\text{I} & 0.0150 \text{ L} \times 0.50 \text{ moles} & 0.0350 \text{ L} \times 0.50 \text{ moles} \\
\text{C} & 0.0075 \text{ moles} & 0.0175 \text{ moles} \\
\text{E} & 0 & 0.0010 \text{ moles} \\
\end{array}
\]

\[
[\text{OH}^-] = \frac{0.0010 \text{ moles}}{0.050 \text{ L}} = 0.20 \text{M}
\]

\[\text{pOH} = 0.70\]
\[\text{pH} = 13.30\]

2. Calculate the \([\text{OH}^-]\) in 0.50 M \(\text{NH}_3\text{(aq)}\).

\[
\text{NH}_3 + \text{H}_2\text{O} \rightleftharpoons \text{NH}_4^+ + \text{OH}^- 
\]

\[
\begin{array}{c|c|c|c}
\text{I} & 0.50 & 0 & 0 \\
\text{C} & x & x & x \\
\text{E} & 0.50 - x & x & x \\
\end{array}
\]

\[
\text{Kb} = \frac{\text{Ka}^+}{1.0 \times 10^{-14}}
\]

\[
\begin{array}{c}
\text{Kb} = \frac{1.0 \times 10^{-14}}{1.786 \times 10^{-5}} \\
\end{array}
\]

\[
\begin{array}{c}
\text{small Ka approximation} \\
\text{Kb} = 5.6 \times 10^{-5}
\end{array}
\]

\[
\rightleftharpoons \text{NH}_4^+ \\
\]

\[
\begin{array}{c}
0 \\
\text{1.786 \times 10^{-5}}
\end{array}
\]

\[
\begin{array}{c}
\times 2 \\
\end{array}
\]

\[
\begin{array}{c}
= 1.786 \times 10^{-5}
\end{array}
\]
0.50

\[ x = [\text{OH}^-] = 3.0 \times 10^{-3} \text{ M} \]

3. A titration was performed by adding 0.175 M \( \text{H}_2\text{C}_2\text{O}_4 \) to a 25.00 mL sample of NaOH. The following data was collected.

<table>
<thead>
<tr>
<th>Trial 1</th>
<th>Trial 2</th>
<th>Trial 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final volume of ( \text{H}_2\text{C}_2\text{O}_4 ) from burette (mL)</td>
<td>23.00</td>
<td>39.05</td>
</tr>
<tr>
<td>Initial volume of ( \text{H}_2\text{C}_2\text{O}_4 ) from burette (mL)</td>
<td>4.85</td>
<td>23.00</td>
</tr>
<tr>
<td>average to 16.00 mL</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Calculate the \([\text{NaOH}]\) reject

\[
\text{H}_2\text{C}_2\text{O}_4 + 2\text{NaOH} \rightarrow \text{Na}_2\text{C}_2\text{O}_4 + 2\text{H}_2\text{O}
\]

\[
0.0160 \text{ L} \quad 0.0250 \text{ L} \\
0.175 \text{ M} \quad ? \text{ M}
\]

\[
[\text{NaOH}] = \frac{0.0160 \text{ L} \times 0.175 \text{ mole}}{1 \text{ mole} \text{ H}_2\text{C}_2\text{O}_4} \times \frac{2 \text{ mole NaOH}}{0.0250 \text{ L}}
\]

\[
= 0.224 \text{ M}
\]

4. A 250.0 mL sample of HCl with a pH of 2.000 is completely neutralized with 0.200 M NaOH. What volume of NaOH is required to reach the stoichiometric point.

\[
\text{pH} = 2.000 \quad [\text{H}^+] = 0.010 \text{ M}
\]

\[
\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}
\]

\[
0.2500 \text{ L} \times \frac{0.0100 \text{ mole}}{1 \text{ mole HCl}} \times \frac{1 \text{ mole NaOH}}{0.200 \text{ mole}} = 0.0125 \text{ L}
\]
5. If the HCl were titrated with 0.200 M NH\textsubscript{3}(aq) instead of 0.200 M NaOH, how would the volume of base required to reach the equivalence point compare with the volume calculated in the last question? Explain your answer.

It would be the same
HCl forces the reaction to completion so a weak base is as good as a strong base for neutralizing a strong acid.

6. Consider the following salt ammonium acetate, NH\textsubscript{4}CH\textsubscript{3}COO.
   a) Write the equation for the dissociation of

\[
\text{NH}_4\text{CH}_3\text{COO} \rightarrow \text{NH}_4^+ + \text{CH}_3\text{COO}^- 
\]

b) Write the equations for the hydrolysis reactions that occur.

\[
\text{CH}_3\text{COO}^- + \text{H}_2\text{O} \rightleftharpoons \text{CH}_3\text{COOH} + \text{OH}^- \\
\text{NH}_4^+ + \text{H}_2\text{O} \rightleftharpoons \text{NH}_3 + \text{OH}^- 
\]

c) Explain why a solution of NH\textsubscript{4}CH\textsubscript{3}COO has a pH =7.00. Support your answer with a calculation.

\[
\text{Ka}(\text{NH}_4^+) = 5.6 \times 10^{-10} \\
\text{Kb}(\text{CH}_3\text{COO}^-) = \text{Kw} = 5.6 \times 10^{-10} 
\]