1. Circle the Bronsted-Lowry base in the following equation: \( \text{C}_2\text{H}_5\text{NH}_2(aq) \) + \( \text{H}_2\text{O} \) (l) \( \rightarrow \) \( \text{C}_6\text{H}_5\text{NH}_3^+(aq) \) + \( \text{OH}^- \) (aq)

2. Consider 2 solutions. Sol'n A is 0.20 M KBr (aq), and Sol'n B is 0.20 M CaBr\(_2\) (aq). Which one of the following statements is true? Circle the one best answer below.
   a. \( [\text{Br}^-] \) is greater in Sol'n A
   b. \( [\text{Br}^-] \) is greater in Sol'n B
   c. \( [\text{Br}^-] \) is the same in Sol'n A and Sol'n B

3. Write the full and net ionic equations for the following reaction; include all physical states and charges on ions.
   \((\text{NH}_4)_2\text{SO}_4(aq) + \text{Ba(NO}_3_2)(aq) \rightarrow \text{BaSO}_4(s) + 2 \text{NH}_4\text{NO}_3(aq)\)

   full ionic equation:
   \[ \text{NH}_4^+(aq) + \text{SO}_4^{2-}(aq) + \text{Ba}^{2+}(aq) + 2 \text{NO}_3^-(aq) \rightarrow \text{BaSO}_4(s) + 2 \text{NH}_4^+(aq) + 2 \text{NO}_3^-(aq) \]

   net ionic equation:
   \[ \text{Ba}^{2+}(aq) + \text{SO}_4^{2-}(aq) \rightarrow \text{BaSO}_4(s) \]

4. \(\text{Ni(ClO}_4)_2\) is a soluble ionic compound. Which of the following is the best representation of the species in an aqueous solution of \(\text{Ni(ClO}_4)_2\)? Circle the one best answer below.
   a. \(\text{Ni}^{2+} \) & \(\text{Cl}^- \) & \(\text{O}_2^2-\)
   b. \(\text{Ni(ClO}_4)_2\)
   c. \(\text{Ni}^{2+} \) & \(\text{ClO}_4^-\)
   d. \(\text{Ni} \) & \(\text{Cl}_2 \) & \(\text{O}_2\)
   e. \(\text{Ni}^{4+} \) & \(\text{ClO}_4^-\)

5. Which of the following solutes would result in an aqueous solution with the greatest ability to conduct electricity? Circle the one best answer below.
   a. \(\text{C}_6\text{H}_5\text{Br}_2\) - a soluble molecular cmpd
   b. \(\text{HClO}_3\) - a weak acid
   c. \(\text{BaSO}_4\) - an insoluble ionic cmpd
   d. \(\text{Mg(NO}_3)_2\) - a soluble ionic cmpd
   e. all of these solutions would have the same conductivity

6. 25.00 mL of 12.75 M \(\text{HClO}_4\) (aq) is diluted until a final solution volume of 750.0 mL is achieved. Calculate the molar concentration of the new, dilute \(\text{HClO}_4\) (aq).

   \[
   \text{M}_1\text{V}_1 = \text{M}_2\text{V}_2
   \]

   \[
   (12.75 \text{ M})(25.00 \text{ mL}) = \text{M}_2(750.0 \text{ mL})
   \]

   \[
   \text{M}_2 = \frac{12.75 \text{ M} \times 25.00 \text{ mL}}{750.0 \text{ mL}} = \boxed{0.4250 \text{ M}}
   \]

7. Consider the following reaction: \(2\text{AlCl}_3(aq) + 3\text{K}_2\text{CO}_3(aq) \rightarrow \text{Al}_2(\text{CO}_3)_3(s) + 6\text{KCl(aq)}\).

   100.0 mL of 0.750 M \(\text{AlCl}_3\) (aq) and 300.0 mL of 0.222 M \(\text{K}_2\text{CO}_3\) (aq) are combined and allowed to react. Calculate the theoretical yield (in g) of \(\text{Al}_2(\text{CO}_3)_3\). For \(\text{Al}_2(\text{CO}_3)_3\), molar mass = 234.0 g/mol.

   \[
   \text{mol} \text{AlCl}_3 = \text{V} \times \text{M} = 0.0750 \text{ mol AlCl}_3
   \]

   \[
   \text{mol} \text{K}_2\text{CO}_3 = \text{V} \times \text{M} = 0.0666 \text{ mol K}_2\text{CO}_3
   \]

   \[
   0.0666 \text{ mol K}_2\text{CO}_3 \times \frac{1 \text{ mol M}_2(\text{CO}_3)_3}{3 \text{ mol K}_2\text{CO}_3} \times \frac{234.09 \text{ g}}{1 \text{ mol M}_2(\text{CO}_3)_3} = 5.19 \text{ g Al}_2(\text{CO}_3)_3
   \]
8. Consider 0.800 M Sr(NO₃)₂ (aq). 250.0 mL of this solution contains \[ \frac{0.200}{\text{mol}} \times \text{V} \times \text{M} \]

9. Consider the following reaction: \( 2 \text{AgNO}_3 \text{(aq)} + \text{K}_2\text{CrO}_4 \text{(aq)} \rightarrow \text{Ag}_2\text{CrO}_4 \text{(s)} + 2 \text{KNO}_3 \text{(aq)} \)
   a. Which compound is the precipitate in this reaction? \( \text{AgNO}_3, \text{K}_2\text{CrO}_4, \text{Ag}_2\text{CrO}_4, \text{or KNO}_3 \)
   b. Which one of the following is a spectator ion in this reaction? \( \text{Ag}^+, \text{K}^+, \text{CrO}_4^{2-}, \text{or H}_2\text{O} \)
   c. Calculate the volume (in mL) of 1.674 M AgNO₃ (aq) that reacts completely with 7.75 mL of 2.333 M K₂CrO₄ (aq).
      \[ \frac{0.00775 \text{ L sol'n}}{\text{L sol'n}} \times \frac{2.333 \text{ mol K}_2\text{CrO}_4}{1 \text{ mol K}_2\text{CrO}_4} \times \frac{2 \text{ mol AgNO}_3}{1 \text{ L sol'n}} \times \frac{1.674 \text{ mol AgNO}_3}{1.674 \text{ mol AgNO}_3} = 0.0216 \text{ L sol'n} \]
      or
      \[ 21.6 \text{ mL} \]

10. Calculate the mass (in g) of \( \text{Cu(C}_2\text{H}_3\text{O}_2)_2 \) (molar mass = 181.6 g/mol) required to prepare 500.0 mL of a solution that has \( [\text{C}_2\text{H}_3\text{O}_2^-] = 0.484 \text{M} \).

11. Give the chemical formulas and physical states for the products that will form when the following reactants are combined; then balance the equation. If no reaction will occur write NO RXN.

\[ \text{BaBr}_2 \text{(aq)} + \text{Pb(NO}_3)_2 \text{(aq)} \rightarrow \text{PbBr}_2 \text{(s)} + \text{Ba(NO}_3)_2 \text{(aq)} \]
\[ 2 \text{Na}_2\text{PO}_4 \text{(aq)} + 3 \text{Ni(NO}_3)_2 \text{(aq)} \rightarrow \text{Ni}_2\text{(PO}_4)_3 \text{(s)} + 6 \text{NaNO}_3 \text{(aq)} \]
1. Which of the following solutes would result in an aqueous solution with the greatest ability to conduct electricity? Circle the one best answer below.
   a. \( \text{C}_6\text{H}_5\text{Br}_2 \) - a soluble molecular cmpd
   b. \( \text{HClO}_2 \) - a weak acid
   c. \( \text{BaSO}_4 \) - an insoluble ionic cmpd
   d. \( \text{Mg(NO}_3\text{)}_2 \) - a soluble ionic cmpd
   e. all of these solutions would have the same conductivity

2. \( \text{Ni(ClO}_4\text{)}_2 \) is a soluble ionic compound. Which of the following is the best representation of the species in an aqueous solution of \( \text{Ni(ClO}_4\text{)}_2 \)? Circle the one best answer.
   a. \( \text{Ni}^{2+} \) & \( \text{Cl}^- \) & \( \text{O}^{2-} \)
   b. \( \text{Ni(ClO}_4\text{)}_2 \)
   c. \( \text{Ni}^{2+} \) & \( \text{ClO}_4^- \)
   d. \( \text{Ni} \) & \( \text{Cl}_2 \) & \( \text{O}_2 \)
   e. \( \text{Ni}^{4+} \) & \( \text{ClO}_4^{-} \)

3. Consider the following reaction: \( 2 \text{AgNO}_3 \) (aq) + \( \text{K}_2\text{CrO}_4 \) (aq) \( \rightarrow \) \( \text{Ag}_2\text{CrO}_4 \) (s) + \( 2 \text{KNO}_3 \) (aq).
   a. Which compound is the precipitate in this reaction? \( \text{AgNO}_3 \), \( \text{K}_2\text{CrO}_4 \), \( \text{Ag}_2\text{CrO}_4 \), or \( \text{KNO}_3 \)
   b. Which one of the following is a spectator ion in this reaction? \( \text{Ag}^+ \), \( \text{K}^+ \), \( \text{CrO}_4^{2-} \), or \( \text{H}_2\text{O} \)
   c. Calculate the volume (in mL) of 2.067 M \( \text{AgNO}_3 \) (aq) that reacts completely with 7.75 mL of 1.458 M \( \text{K}_2\text{CrO}_4 \) (aq).

4. Consider 0.800 M \( \text{Sr(NO}_3\text{)}_2 \) (aq). 250.0 mL of this solution contains \( \frac{.200}{\text{mol} = \text{V} \cdot \text{M}} \) mol \( \text{Sr(NO}_3\text{)}_2 \).

5. Circle the Bronsted-Lowry acid in the following equation: \( \text{C}_6\text{H}_5\text{NH}_2 \) (aq) + \( \text{H}_2\text{O} \) (l) \( \rightarrow \) \( \text{C}_6\text{H}_5\text{NH}_3^+ \) (aq) + \( \text{OH}^- \) (aq)

6. Consider 2 solutions. Sol'n A is 0.20 M KBr (aq), and Sol'n B is 0.10 M CaBr\(_2\) (aq). Which one of the following statements is true? Circle the one best answer below.
   a. \( \text{Br}^- \) is greater in Sol'n A
   b. \( \text{Br}^- \) is greater in Sol'n B
   c. \( \text{Br}^- \) is the same in Sol'n A and Sol'n B

7. Calculate the mass (in g) of \( \text{Cu(C}_2\text{H}_3\text{O}_2)_2 \) (molar mass = 181.6 g/mol) required to prepare 500.0 mL of a solution that has [\( \text{C}_2\text{H}_3\text{O}_2^- \)] = 0.484 M.

8. Give the chemical formulas and physical states for the products that will form when the following reactants are combined; then balance the equation. If no reaction will occur write NO RXN.

\[2 \text{Na}_3\text{PO}_4 \text{(aq)} + 3 \text{Ni(NO}_3\text{)}_2 \text{(aq)} \rightarrow \text{Ni}_3\text{(PO}_4\text{)}_2 \text{(s)} + 6 \text{NaNO}_3 \text{(aq)}\]
9. Consider the following reaction: $2 \text{AlCl}_3 (aq) + 3 \text{K}_2\text{CO}_3 (aq) \rightarrow \text{Al}_2(\text{CO}_3)_3 (s) + 6 \text{KCl (aq)}$.

100.0 mL of 0.950 M AlCl$_3$ (aq) and 200.0 mL of 0.222 M K$_2$CO$_3$ (aq) are combined and allowed to react. Calculate the theoretical yield (in g) of Al$_2$(CO$_3$)$_3$. For Al$_2$(CO$_3$)$_3$, molar mass = 234.0 g/mol.

\[
\frac{0.950 \text{ mol AlCl}_3 \times \frac{1 \text{ mol Al}_2(\text{CO}_3)_3}{3 \text{ mol K}_2\text{CO}_3}}{0.222 \text{ mol K}_2\text{CO}_3} = \frac{3.460 \text{ g Al}_2(\text{CO}_3)_3}{1 \text{ mol Al}_2(\text{CO}_3)_3}
\]

10. 25.00 mL of 12.75 M HClO$_4$ (aq) is diluted until a final solution volume of 500.0 mL is achieved. Calculate the molar concentration of the new, dilute HClO$_4$ (aq).

\[
(12.75 \text{ M})(25.00 \text{ mL}) = M_2(500.0 \text{ mL})
\]

\[
M_2 = 0.6375 \text{ M}
\]

11. Write the full and net ionic equations for the following reaction, include all physical states and charges on ions.

$\text{(NH}_4\text{)}_2\text{SO}_4 (aq) + \text{Ba(NO}_3\text{)}_2 (aq) \rightarrow \text{BaSO}_4 (s) + 2 \text{NH}_4\text{NO}_3 (aq)$

full ionic equation:

\[
2\text{NH}_4^+(aq) + \text{SO}_4^{2-}(aq) + \text{Ba}^{2+}(aq) + 2\text{NO}_3^-(aq) \rightarrow \text{BaSO}_4 (s) + 2\text{NH}_4^+(aq) + 2\text{NO}_3^-(aq)
\]

net ionic equation:

\[
\text{Ba}^{2+}(aq) + \text{SO}_4^{2-}(aq) \rightarrow \text{BaSO}_4 (s)
\]