1. Write the balanced molecular, ionic, and net ionic equations for the following acid-base reaction. [6 pts]

$$\text{HBr (aq) + Ba(OH)_2 (aq) \rightarrow}$$

molecular equation: $$2 \text{HBr (aq) + Ba(OH)_2 (aq) \rightarrow BaBr}_2 (aq) + 2 \text{H}_2\text{O (l)}$$

ionic equation: $$2\text{H}^+(aq) + 2\text{Br}^-(aq) + \text{Ba}^{2+}(aq) + 2\text{OH}^-(aq) \rightarrow \text{Ba}^{2+}(aq) + 2\text{Br}^-(aq) + 2\text{H}_2\text{O(l)}$$

net ionic equation: $$2\text{H}^+(aq) + 2\text{OH}^-(aq) \rightarrow 2\text{H}_2\text{O(l)} \text{ or } \text{H}^+(aq) + \text{OH}^-(aq) \rightarrow \text{H}_2\text{O(l)}$$

2. The common constituent in basic solutions is: [3 pts]

   a) $\text{H}_2$
   b) $\text{H}_3\text{O}^+$
   c) $\text{OH}^-$
   d) $\text{NH}_3$
   e) $\text{Cl}^-$

3. True or False

   a) An acid is a hydrogen ion ($\text{H}^+$) donor. [2 pts]
   
   **TRUE**

   b) A weak acid does not ionize when dissolved in water. [2 pts]
   
   **FALSE, a weak acid does ionize to a small extent in water.**

   c) $\text{CH}_3\text{COOH}$ is a strong acid. [2 pts]
   
   **FALSE, carboxylic acids are weak acids.**

4. Assign the oxidation number (charge) to Fe and O in $\text{Fe}_2\text{O}_3$. Also, identify the reactant that is oxidized and the reactant that is reduced in the following reaction. [4 pts]

$$4 \text{Fe (s) + 3 O}_2 (g) \rightarrow 2 \text{Fe}_2\text{O}_3 (s)$$

Oxidation number of O in $\text{Fe}_2\text{O}_3$ $-2$

Oxidation number of Fe in $\text{Fe}_2\text{O}_3$ $+3$

Reactant oxidized $\text{Fe}$

Reactant reduced $\text{O}_2$
5. Complete and balance the following precipitation reaction:

\[
\text{CaCl}_2 (aq) + K_3\text{PO}_4 (aq) \rightarrow \text{ } \]

When the equation is balanced with the smallest set of whole number coefficients, the balancing coefficient for CaCl\(_2\) is? Circle the correct answer. [3 pts]

a) 1 b) 2 c) 3 d) 4 e) 6

\[3 \text{ CaCl}_2 (aq) + 2 K_3\text{PO}_4 (aq) \rightarrow 6 \text{ KCl (aq)} + \text{Ca}_3(\text{PO}_4)_2 (s)\]

6. 150.0 g of glucose (C\(_6\)H\(_{12}\)O\(_6\)) are dissolved in 250.0 mL of water. What is the molarity of this solution? [4 pts]

\[
M = \frac{\text{mol solute}}{\text{L of soln}}
\]

\[
\text{mol solute} = 150.0 \text{ g glucose} \times \frac{1 \text{ mol glucose}}{180.2 \text{ g glucose}} = 0.8324 \text{ mol glucose}
\]

\[
M = \frac{0.8324 \text{ mol}}{0.2500 \text{ L}} = 3.330 \text{ M}
\]

7. How many milliliters of a 0.992 M stock solution of KCl would be needed to prepare 0.250 L of 0.175 M KCl? Circle the correct answer. [3 pts]

\[
M_cV_c = M_dV_d
\]

\[
(0.992 \text{ M})V_c = (0.175 \text{ M})(0.250 \text{ L})
\]

\[
V_c = 0.0441 \text{ L} = 44.1 \text{ mL}
\]

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<th>EXCEPTIONS</th>
<th>INSOLUBLE COMPOUNDS</th>
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<td>Nitrites (NO(_3^-)), bicarbonates (HCO(_3^-)), and chlorates (ClO(_3^-))</td>
<td>Halides of Ag(^+), Hg(_2^{2+}), and Pb(^{2+})</td>
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<td>Sulfates of Ag(^+), Ca(^{2+}), Sr(^{2+}), Ba(^{2+}), and Pb(^{2+})</td>
<td>Hydroxides (OH(^-))</td>
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