Please show your work for all calculations, and report answers to the proper number of significant digits to receive full credit. For calculations, circle your final answer.

1. Provide products for and balance each of the following reactions. Hint: you will first need to look at the reactants and determine whether the reaction is a precipitation, neutralization, or redox reaction.

   a. _____ Ca(OH)₂ (aq) + _____ H₂SO₄ (aq) \[ \rightarrow \]

   b. _____ Cu (s) + _____ AgNO₃ (aq) \[ \rightarrow \]

2. Assign oxidation numbers for each of the atoms in the following reaction and determine which element is oxidized and which is reduced.

   \[ \text{Mg (s)} + 2 \text{AgNO}_3 (aq) \rightarrow 2 \text{Ag (s)} + \text{Mg(NO}_3)_2 (aq) \]

   Reactants: \( \text{Mg} = \), \( \text{Ag} = \), \( \text{N} = \), \( \text{O} = \)

   Products: \( \text{Ag} = \), \( \text{Mg} = \), \( \text{N} = \), \( \text{O} = \)

   Oxidized: \(____)\hspace{1cm} \text{Reduced:} \(____)\]

3. An 0.07869 \( M \) solution of oxalic acid (\( \text{H}_2\text{C}_2\text{O}_4 \), a diprotic acid) is used to titrate 20.00 mL of KOH of unknown concentration. The endpoint of the titration is reached after 13.64 mL of oxalic acid solution has been added to the base.

   a. Write a balanced equation for the reaction described above.

   b. Calculate the molarity of the KOH solution. Hint: This is \textbf{not} a dilution problem.

Continued on reverse.
4. a. A gas sample is originally in a container with a volume of 0.75 L and at a pressure of 1.00 atm. If the volume of the container is increased to 1.27 L, what will be the new pressure of the gas?

b. What is the name of the gas law needed to answer the question in part a?

5. When a piece of nickel is put in a solution containing aluminum chloride no reaction is observed. In other words, 

\[
\text{Ni (s) + AlCl}_3 (aq) \rightarrow \text{No Reaction}
\]

In your own words, explain how you could tell ahead of time that there would be no reaction when these two substances are mixed.