Answer all of the following questions. Remember to show all work and pay attention to significant figures and units.

1. Which of the following is the correct neutralization reaction between oxalic acid (C₂H₂O₄) and sodium hydroxide?
   a. C₂H₂O₄ (aq) + 2 NaOH (aq) → 2 CO₂ (g) + H₂O (l) + Na₂C₂O₄ (aq)
   b. C₆H₅O₇ (aq) + NaOH (aq) → C₆H₆O₇ (aq) + Na₃C₆H₅O₇ (aq)
   c. C₂H₂O₄ (aq) + NaOH (aq) → 2 H₂O (l) + Na₂C₂O₄ (aq)
   d. C₂H₂O₄ (aq) + NaOH (aq) → 2 CO₂ (g) + NaOH (aq)  
      \[ \text{Version 2: } d \quad \text{a + 2} \]

2. A titration is carried out to determine the concentration of an unknown sample of oxalic acid. A 0.05505 M solution of sodium hydroxide is used to titrate a 25.00 mL sample of oxalic acid. **NOTE:** If you can do part b. or c. but not the part before it, write "I don’t know how to do this question, but I’m going to assume the answer is (fill in made-up number here), and use this for the rest of the question." As long as your method is correct, you won’t lose points on the parts of the question that you can do.
   a. Use the titration data below and the information at the beginning of the problem to determine how many moles of NaOH are required for the titration. (Hint: Remember that molarity = moles/liters)
      Initial buret reading: 0.28 mL
      Final buret reading: 23.91 mL
      \[ V_{\text{total}} = 23.91 \text{ mL} - 0.28 \text{ mL} = 23.63 \text{ mL} \]
      \[ 23.63 \text{ mL} \left( \frac{1 \text{ L}}{1000 \text{ mL}} \right) = 0.02363 \text{ L} \]
      \[ \text{mol NaOH} \left( \frac{1 \text{ mol C}_2\text{H}_2\text{O}_4}{2 \text{ mol NaOH}} \right) = 0.001301 \text{ mol} \text{ C}_2\text{H}_2\text{O}_4 \]
      \[ \text{Version 2: } 0.001229 \text{ mol NaOH} \]
   b. Determine how many moles of oxalic acid were reacted during the titration. Refer to the correct neutralization reaction from number 1.
      \[ \text{Version 2: } 0.0006147 \text{ mol C}_2\text{H}_2\text{O}_4 \]
   c. Use the number of moles of oxalic acid from part b. and the information at the beginning of the problem to determine the molarity of the oxalic acid solution.
      \[ 25.00 \text{ mL C}_2\text{H}_2\text{O}_4 \left( \frac{1 \text{ L}}{1000 \text{ mL}} \right) = 0.02500 \text{ L C}_2\text{H}_2\text{O}_4 \]
      \[ \text{molarity} \left( \frac{0.0006504 \text{ mol C}_2\text{H}_2\text{O}_4}{0.02500 \text{ L C}_2\text{H}_2\text{O}_4} \right) = 0.02602 \text{ M C}_2\text{H}_2\text{O}_4 \]
      \[ \text{Version 2: } 0.02459 \text{ M C}_2\text{H}_2\text{O}_4 \]

3. In the formula \( q = -Kc\Delta T \), \( K \) refers to:
   a. The heat released or absorbed in the reaction that was performed.
   b. The calorimeter constant for the container in which the reaction was performed.
   c. The change in temperature that occurred during the reaction.
   d. The equilibrium constant for the reaction that was performed.
      \[ \text{Version 2: } d \quad \text{b + 1} \]

4. A double salt is:
   a. A compound that is a combination of two different ionic compounds in a fixed ratio.
   b. A compound that contains twice as many cations as anions.
   c. A compound whose molecular weight is twice that of water.
   d. A compound that is twice as salty as table salt.
      \[ \text{Version 2: } b \quad \text{a + 2} \]