Part A: Titrations: Strong Acid –Strong Base

1) The titration of a 25.00-mL sample of HNO_3 of unknown molarity requires 18.22 mL of a 0.100 M $Ca(OH)_2$ solution to reach the equivalence point.
   a) Write the reaction for this neutralization process (the molecular reaction right now).

   b) What is the molarity of the unknown HNO_3 solution? Remember $M_1V_1=M_2V_2$ is *only* for calculating dilutions and should *not* be used for titrations.

   c) What is the net ionic reaction? What is the pH at the equivalence point? How would you calculate the pH at the equivalence point?

Part B: Titration Weak Acid-Weak Base

2) Your PAL team will be generating a plot for the titration of 0.100 L of 0.050 M propanoic acid ($HC_3H_5O_2$, $K_a = 1.3 \times 10^{-5}$) with 0.075 M NaOH.

   a) Calculate the pH when a. no base is added, b. after 10.0 mL of base added, c. after 33.3 mL of base added, d. after 66.6 mL of base added, and e. after 100. mL of base is added.

   b) Carry out the calculations on a separate sheet of paper.

   c) You can have each person do one calculation or two and combine your team's answers and plot them on the graph provided below.

   d) Label the following regions on your graph:

      a) no added base (only weak acid)

      b) buffer region (both weak acid and conjugate base)

      c) ½-way to equivalence point (midpoint of the titration)

      d) equivalence point (only conjugate base)

      e) after equivalence point (excess strong base)

Titration of 0.100 L of 0.050 M $HC_3H_5O_2$ with 0.075 M NaOH