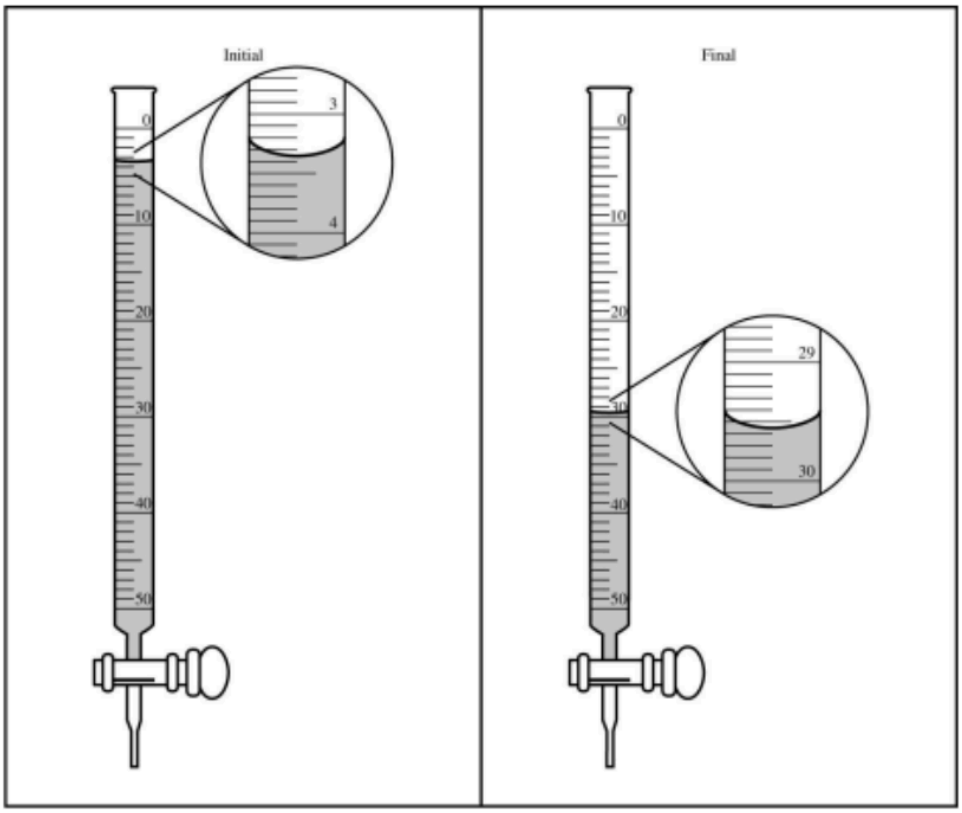
Week 0 - Stoichiometry (Free Response)

$$6\ H^+(aq) + 2\ MnO_4^-(aq) + 5\ H_2C_2O_4(aq) \rightarrow 10\ CO_2(g) + 8\ H_2O(l) + 2\ Mn^{2+}(aq)$$

1. A student dissolved a solid sample of oxalic acid, $H_2C_2O_4$, in water in an Erlenmeyer flask. Then the student titrated the $H_2C_2O_4$ solution in the flask with a solution of $KMnO_4$, which has a dark purple color. The balanced chemical equation for the reaction that occurred during the titration is shown above. The student used a 50.0 mL buret to add the $KMnO_4$ (aq) to the $H_2C_2O_4$ (q) until a faint lavender color was observed in the flask, an indication that the end point of the titration had been reached. The initial and final volume readings of the solution in the buret are shown below.



(a) Determine the volume of $KMnO_4$ (aq) in mL that was added from during the titration from your initial and final readings of the buret.

(b) Given that the concentration of $KMnO_4$ (aq) was 0.0235 M, calculate the number of moles of MnO_4^- ions that completely reacted with the $H_2C_2O_4$.

(c) Calculate the mass in grams of $H_2C_2O_4$ that was fully dissolved in the water in the Erlenmeyer flask.

(d) If the buret used to dispense the $KMnO_4$ (aq) has leftover water droplets inside it prior to adding the $KMnO_4$ (aq), would the mass calculated in part (c) be greater than or less than the actual mass of $H_2C_2O_4$ that reacted?