Titrations

1. Earl N. Myers performed a titration by adding 0.115 mol/L $NaOH_{(aq)}$ to a 25.00 mL sample of $H_2SO_{4(aq)}$.

$$2\ NaOH_{(aq)} + H_2SO_{4(aq)} \rightarrow 2\ H_2O_{(l)} + Na_2SO_{4(aq)}$$

Reading(mL)	Trial 1	Trial 2	Trial 3
final reading	17.05	28.00	39.00
initial reading	4.00	17.05	28.00
volume NaOH added			

a) Calculate the volume of NaOH added in each trial.

b) Which solution was in the buret? _____

c) Why should we omit the result in Trial 1 in the calculation of the acid concentration.

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d) Use Trials 2 & 3 to calculate the concentration of $H_2SO_{4(aq)}$. *(0.0252 mol/L)*

2. 25.0 mL of $HCl_{(aq)}$ is titrated against a solution of KOH with a concentration of 0.75 mol/L. The following data was obtained from the burette:

	Trial 1	Trial 2	Trial 3
Final Reading	14.3 mL	28.4 mL	42.6 mL
Initial Reading	0.1 mL	14.3 mL	28.4 mL

$$HCl(aq) + KOH(aq) \rightarrow H_2O(l) + KCl(aq)$$

Determine the concentration of the acid used. *(0.425 mol/L)*

3. A primary standard of $Na_2CO_{3(s)}$ is used to determine the concentration of a hydrochloric acid solution. In the first trial a solution containing 0.5012 g of $Na_2CO_{3(s)}$ required 21.35 mL of $HCl_{(aq)}$ to reach the equivalence point.

$$2\ HCl_{(aq)} + Na_2CO_{3(s)} \rightarrow H_2O_{(l)} + CO_{2(g)} + 2\ NaCl_{(aq)}$$

a) Based on this trial, what is the concentration of $HCl_{(aq)}$? *(0.443 mol/L)*

(b) Why is it important to perform more than one trial?

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4. A pipette is used to transfer four 25.00 mL samples of hydrochloric acid, HCl(aq), to flasks. Each sample is then titrated to the endpoint using a 0.001887 mol/L solution sodium carbonate, Na_2CO_3. The results below were obtained. What is the concentration of HCl(aq)?

$$2\ HCl_{(aq)} + Na_2CO_{3(s)} \rightarrow H_2O_{(l)} + CO_{2(g)} + 2\ NaCl_{(aq)}$$

Trial	1	2	3	4
Final reading(mL)	20.98	33.26	33.12	45.43
Initial reading(mL)	8.08	20.98	20.83	33.12
Volume of Na2CO3 added (mL)	12.90	12.28	12.29	12.31

Calculate the molar concentration of the $HCl_{(aq)}$. *(0.00187 mol/L)*