# Titrations Practice Worksheet

*Find the requested quantities in the following problems:*

1)  If it takes 54 mL of 0.10 M NaOH to neutralize 125 mL of an HCl solution, what is the concentration of the HCl?

2)  If it takes 25 mL of 0.050 M HCl to neutralize 345 mL of NaOH solution, what is the concentration of the NaOH solution?

3)  If it takes 50.0 mL of 0.50 M KOH solution to completely neutralize 125 mL of sulfuric acid solution ($H_2SO_4$), what is the concentration of the $H_2SO_4$ solution?

4)  Can I titrate a solution of unknown concentration with another solution of unknown concentration and still get a meaningful answer?  Explain your answer in a few sentences.

5)  Explain the difference between an endpoint and equivalence point in a titration.

# Answers to the Titrations Practice Worksheet

For questions 1 and 2, the units for your final answer should be "M", or "molar", because you're trying to find the molarity of the acid or base solution. To solve these problems, use $M_1V_1 = M_2V_2$.

1) 0.043 M HCl
2) 0.0036 M NaOH

For problem 3, you need to divide your final answer by two, because $H_2SO_4$ is a diprotic acid, meaning that there are two acidic hydrogens that need to be neutralized during the titration. As a result, it takes twice as much base to neutralize it, making the concentration of the acid appear twice as large as it really is.

3) 0.10 M $H_2SO_4$

4) You cannot do a titration without knowing the molarity of at least one of the substances, because you'd then be solving one equation with two unknowns (the unknowns being $M_1$ and $M_2$).

5) Endpoint: When you actually stop doing the titration (usually, this is determined by a color change in an indicator or an indication of pH=7.0 on an electronic pH probe)

Equivalence point: When the solution is exactly neutralized. It's important to keep in mind that the equivalence point and the endpoint are not exactly the same because indicators don't change color at exactly 7.0000 pH and pH probes aren't infinitely accurate. Generally, you can measure the effectiveness of a titration by the closeness of the endpoint to the equivalence point.