Dougherty Valley HS Chemistry
Acids & Bases – More Titration Practice

Name: **Period:**   **Seat#:**

Directions:
- Show your work!
- Some answers are provided at the end of the problem. They are underlined.

1) How many mL of a 0.10 M $Ca(OH)_2$ solution are required to neutralize 25.0 mL of 0.50 M HNO_3?

2) If it takes 50 mL of 0.5 M KOH solution to completely neutralize 125 mL of sulphuric acid solution ($H2SO4$), what is the concentration of the acid solution?_0.1 M_

3) It takes 26.23 mL of a 1.008 M NaOH solution to neutralize a solution of 5g of an unknown monoprotic acid in 150.2 mL of solution. What is the molecular weight of the unknown? _192.3 g/mol_

4) What volume of 1.015 mol/L magnesium hydroxide is needed to neutralize 40.0 mL of 1.60 mol/L HCl? _31.5 mL_

5) In a titration experiment, 25.0 mL of an aqueous solution of sodium hydroxide was required to neutralize 50.0 mL of a 0.010 M hydrochloric acid. What is the concentration of the sodium hydroxide solution? _0.020 M_

6) What volume of 0.150 M HCl is needed to neutralize each solution listed below?

   a. 25.0 mL of 0.135 M NaOH _22.5 mL_

   b. 20.0 mL of 0.185 M NH_4OH _24.7 mL_

   c. 80.0 mL of 0.0045 M $Ca(OH)_2$ _4.8 mL_

7) What concentration of sodium hydroxide is required for each neutralization reaction?

    d.   37.82 mL of NaOH neutralizes 15.00 mL of 0.250 M HF *0.0991 M*

    e.   21.56 mL of NaOH neutralizes 20.00 mL of 0.145 M H_2SO_4 *0.269 M*

    f.   14.27 mL of NaOH neutralizes 25.00 mL of 0.105 M H_3PO_4 *0.552 M*

8) A 25.0 mL sample of sulphuric acid is completely neutralized by adding 32.8 mL of 0.116 M ammonia solution. Ammonium sulphate is formed. What is the concentration of the sulphuric acid? *7.6 x 10⁻² M*

9) Lactic acid, a chemical responsible for muscle fatigue, is a monoprotic acid. When 0.578 g of lactic acid is titrated with 0.206 M NaOH, a volume of 31.11 mL of NaOH is used. What is the molar mass of lactic acid?
HA + NaOH → NaA + H_2O

10) A volume of 25.0 mL of nitric acid, HNO_3 is titrated with 0.12 M NaOH. To completely neutralize the acid 10 mL of NaOH must be added. Find the concentration (mol/L) of the nitric acid. HNO_3 + NaOH → $NaNO_3$ + H_2O

11) Malonic acid is a diprotic acid used in the production of pharmaceuticals. A 0.965 g sample of malonic acid requires 45.91 mL of 0.404 M LiOH to be neutralized. Determine the molar mass (g/mol) for malonic acid.
H_2A + 2 LiOH → Li_2A + 2 H_2O

12) To find the molarity of sulfuric acid, H_2SO_4 it is titrated with 0.75 M KOH. It requires 328.4 mL of KOH to neutralize a 40.00 mL sample of sulfuric acid. Calculate the concentration (mol/L) of the sulfuric acid.
$H_2SO_4 + 2\ KOH \rightarrow K_2SO_4 + 2\ H_2O$
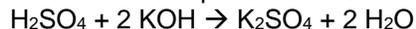
13) Boric acid is a triprotic acid that is used as an ant and roach killer. A 1.42-g sample of boric acid is neutralized by 157 mL of 0.4388 M NaOH. Determine the molar mass (g/mol) for boric acid. $H_3A + 3\ NaOH \rightarrow Na_3A + 3\ H_2O$

14) Tartaric acid, $H_2C_4H_4O_6$ is neutralized with 0.100 M NaOH. A sample of 3.0 g of tartaric acid reacts with 45 mL of base. How concentrated is the base? $H_2C_4H_4O_6 + 2\ NaOH \rightarrow Na_2C_4H_4O_6 + 2\ H_2O$

15) Using the following graph, determine the concentration of the unknown titrand.

Titration of 25 mL HCl of Unknown Concentration with 0.10 M Sodium Hydroxide as Titrant

pH

Equivalence point

pH

mL of 0.10 NaOH added