

Worksheet - Titration Problems

1. What is the M of NaOH if it takes 40.0 ml of NaOH to reach the equivalence point in a titration with 50.0 ml of 0.200 M HCl?

$$(1)(.200)(50.0) = (1)(M)(40.0)$$

$$M = .250M$$

or



$$(.200M)(.050L) \times \frac{1\text{mol NaOH}}{1\text{mol HCl}} = \frac{.01\text{mol}}{.040L} = .25M$$

2. 50. ml of 0.30 M KOH are required to titrate 60. ml of H_2SO_4 . What is the M of the H_2SO_4 ?

$$(2)(M)(60.\text{mL}) = (1)(.30M)(50.\text{mL})$$

$$M = .13M$$

or



$$(.050\text{mL})(.30M) \times \frac{1\text{mol H}_2\text{SO}_4}{2\text{mol KOH}} = \frac{.0075\text{mol}}{.060L} =$$

$$.13M$$

3. 60.0 ml of 1.20 M NaOH are required to titrate 40.0 ml of HF. What is the M of the HF?

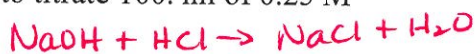
$$(1)(M)(40.0\text{mL}) = (1)(1.20M)(60.0\text{mL})$$

$$M = 1.80M$$

4. What volume of 0.40 M NaOH would be required to titrate 100. ml of 0.25 M HCl?

$$(1)(.25M)(100\text{mL}) = (1)(.40M)V$$

$$V = 63\text{mL}$$



$$(.100L)(.25M) \times \frac{1\text{mol NaOH}}{1\text{mol HCl}} = .025\text{mol}$$

$$.40M = \frac{.025\text{mol}}{xL}$$

$$x = .063L \text{ or } 63\text{mL}$$

5. 40.0 ml of 0.100M H_3PO_4 are required to titrate 150.0 ml of NaOH to the equivalence point. What is the M of the NaOH?

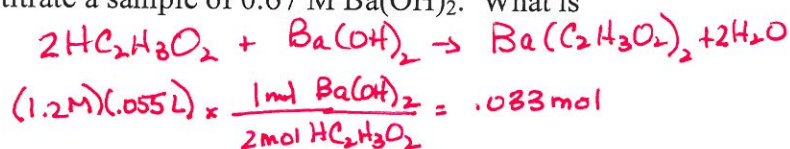
$$(3)(.100M)(40.0\text{mL}) = (1)(M)(150.0\text{mL})$$

$$M = .0800M$$

6. 55 ml of 1.2 M $\text{HC}_2\text{H}_3\text{O}_2$ are used to titrate a sample of 0.67 M $\text{Ba}(\text{OH})_2$. What is volume of the $\text{Ba}(\text{OH})_2$ used?

$$(1)(1.2\text{M})(55\text{mL}) = (2)(.67\text{M})(V)$$

$$V = 49\text{mL}$$



$$.67\text{M} = \frac{.033\text{mol}}{x\text{L}}$$

$$x = .049\text{L or } 49\text{mL}$$

7. 90.0 ml of 0.255 M $\text{Ca}(\text{OH})_2$ are required to titrate 100.0 ml of HCl . What is M of the HCl ?

$$(1)(M)(100.0\text{mL}) = (2)(.255\text{M})(90.0\text{mL})$$

$$M = .459\text{M}$$

8. 50.2 ml of 0.453M $\text{Sr}(\text{OH})_2$ are required to titrate a .755 M H_2SO_4 sample. What is the volume of the H_2SO_4 ?

$$(2)(.755\text{M})(V) = (2)(.453\text{M})(50.2\text{mL})$$

$$V = 30.1\text{mL}$$

9. Would it take more 0.10 M HCl or 0.10 M H_2SO_4 to neutralize 30. ml of NaOH ? Prove it!

Give the NaOH some arbitrary molarity (I'm going to use 1M)

$$\text{for HCl} \rightarrow (1)(.1\text{M})V = (1)(1)(30\text{mL})$$

$$\text{for H}_2\text{SO}_4 \rightarrow (2)(.1\text{M})V = (1)(1)(30\text{mL})$$

← you need only $\frac{1}{2}$ as much H_2SO_4 as HCl to neutralize the base.

10. 30.3 ml of 0.305 M NaOH are required to titrate H_3PO_4 to the equivalence point. How many moles of H_3PO_4 are needed to reach the equivalence point?

$$(.305\text{M})(.0303\text{L}) = .00924\text{ moles NaOH used (OH}^-)$$

Therefore: .00924 moles H^+ needed

$$.00924\text{mol H}^+ \times \frac{1\text{mol H}_3\text{PO}_4}{3\text{moles H}^+} = .00308\text{ moles H}_3\text{PO}_4$$