

Titrations Practice Worksheet

Honors Chemistry



1. If it takes 54-mL of 0.1-M NaOH to neutralize 125-mL of an HCl solution, what is the concentration of the HCl?

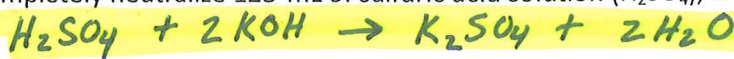
$$\frac{.054\text{-L} \mid .1 \text{ mol NaOH}}{\text{L}} = \frac{.0054 \text{ mol NaOH} \mid 1 \text{ mol HCl}}{1 \text{ mol NaOH}} = \frac{.0054 \text{ mol HCl}}{.125\text{-L}} = \boxed{.043\text{-M HCl}}$$

2. If it takes 25-mL of 0.05-M HCl to neutralize 345-mL of NaOH solution, what is the concentration of the NaOH solution?

$$\frac{.025\text{-L HCl} \mid .05 \text{ mol}}{\text{L}} = \frac{.00125 \text{ mol HCl} \mid 1 \text{ mol NaOH}}{1 \text{ mol HCl}} = \frac{.00125 \text{ mol NaOH}}{.345\text{-L}}$$

$$\boxed{.0036\text{-M NaOH}}$$

3. If it takes 50-mL of 0.5-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?



$$\frac{.05\text{-L KOH} \mid .5 \text{ mol}}{\text{L}} = \frac{.025 \text{ mol KOH} \mid 1 \text{ mol H}_2\text{SO}_4}{2 \text{ mol KOH}} = \frac{.0125 \text{ mol H}_2\text{SO}_4}{.125\text{-L}} = \boxed{.1\text{-M H}_2\text{SO}_4}$$

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.

NO! You must know at least one concentration to determine moles so that stoichiometry can be done.

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

Equivalence Point: $[\text{H}^+] = [\text{OH}^-]$

End Point: the indicator changes color

6. 60-ml of 1.2-M NaOH is required to titrate 40-ml of HF. What is the Molarity of the HF?



$$1.2 \frac{\text{mol}}{\text{L}} \times .06\text{-L} = \frac{.072 \text{ mol NaOH} \mid 1 \text{ mol HF}}{1 \text{ mol NaOH}} = \frac{.072 \text{ mol HF}}{.04\text{-L}} = \boxed{1.8\text{-M HF}}$$

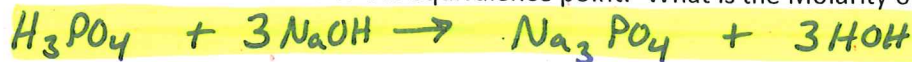


7. What volume of 0.40-M NaOH (in mL) would be required to titrate 100-ml of 0.25-M HCl?

$$.25 \frac{\text{mol}}{\text{L}} \times .1\text{-L} = \frac{.025 \text{ mol HCl}}{1 \text{ mol HCl}} = .025 \text{ mol NaOH}$$

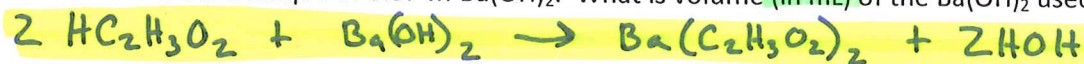
$$V = \frac{\text{mol}}{M} = \frac{.025 \text{ mol}}{.4\text{-M}} = \frac{.0625\text{-L}}{1\text{-L}} = \boxed{62.5\text{-mL NaOH}}$$

8. 40-ml of 0.1-M H₃PO₄ are required to titrate 150-ml of NaOH to the equivalence point. What is the Molarity of the NaOH?



$$.1 \frac{\text{mol}}{\text{L}} \times .04\text{-L} = \frac{.004 \text{ mol H}_3\text{PO}_4}{1 \text{ mol H}_3\text{PO}_4} = \frac{.012 \text{ mol NaOH}}{.15\text{-L}} = \boxed{.08\text{-M NaOH}}$$

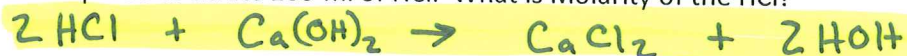
9. 55-ml of 1.2-M H C₂H₃ O₂ are used to titrate a sample of 0.67-M Ba(OH)₂. What is volume (in mL) of the Ba(OH)₂ used?



$$1.2 \frac{\text{mol}}{\text{L}} \times .055\text{-L} = \frac{.066 \text{ mol HC}_2\text{H}_3\text{O}_2}{2 \text{ mol HC}_2\text{H}_3\text{O}_2} = .033 \text{ mol Ba}(\text{OH})_2$$

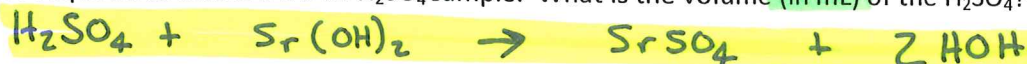
$$V = \frac{\text{mol}}{M} = \boxed{49.3\text{-mL}}$$

10. 90-ml of 0.25-M Ca(OH)₂ are required to titrate 100-ml of HCl. What is Molarity of the HCl?



$$.25 \frac{\text{mol}}{\text{L}} \times .09\text{-L} = \frac{.0225 \text{ mol Ca}(\text{OH})_2}{1 \text{ mol Ca}(\text{OH})_2} = \frac{.045 \text{ mol HCl}}{.1\text{-L}} = \boxed{.45\text{-M HCl}}$$

11. 50-ml of 0.45-M Sr(OH)₂ are required to titrate a .75-M H₂SO₄ sample. What is the volume (in mL) of the H₂SO₄?



$$.45 \frac{\text{mol}}{\text{L}} \times .05\text{-L} = \frac{.0225 \text{ mol}}{1 \text{ mol Sr}(\text{OH})_2} = .0225 \text{ mol H}_2\text{SO}_4$$

$$V = \frac{.0225 \text{ mol}}{.75\text{-M}} = \boxed{30 \text{ mL H}_2\text{SO}_4}$$

12. 30-ml of 0.3-M NaOH is required to titrate H₃PO₄ to the equivalence point. How many moles of H₃PO₄ are needed to reach the equivalence point?



$$.3 \frac{\text{mol}}{\text{L}} \times .03\text{-L} = \frac{.009 \text{ mol NaOH}}{3 \text{ mol NaOH}} = \boxed{.003 \text{ mole H}_3\text{PO}_4}$$