

1) What kind of a reaction is occurring during the titration of an acid and base?

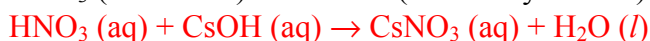
A neutralization reaction (a special kind of double-replacement reaction).

2) What are the products of an acid-base titration?

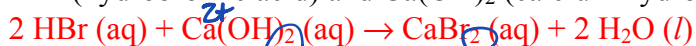
A salt and water.

3) Write *balanced* neutralization equations for the following acid-base titrations:

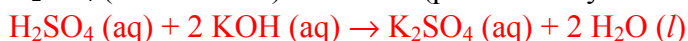
a) HNO₃ (nitric acid) and CsOH (cesium hydroxide)



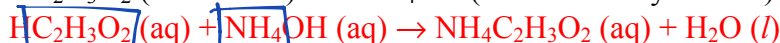
b) HBr (hydrobromic acid) and Ca(OH)₂ (calcium hydroxide)



c) H₂SO₄ (sulfuric acid) and KOH (potassium hydroxide)



d) HC₂H₃O₂ (acetic acid) and NH₄OH (ammonium hydroxide)



4) What quantity is being monitored in a titration? pH of the reaction mixture

5) What quantity is being measured in a titration? Volume of the titrating solution

6) What is an indicator? What is an indicator used for?

An indicator is an organic dye that changes color at a certain pH. It is used to show when the titration has finished.

7) Explain the following terms:

a) Equivalence Point

The pH in a titration when moles of H⁺ = moles of OH⁻.

b) End Point

The pH at which the indicator changes color to indicate that the titration is finished.

8) Determine the molarity of a LiOH solution if 25.0 mL of the solution is neutralized by 18.38 mL of 0.112 M HNO₃ solution. [Remember, find mol LiOH first, then divide by volume. The mole ratio is 1:1.]

$$? \text{ mol LiOH} = 0.01838 \text{ L HNO}_3 \times \frac{0.112 \text{ mol}}{1 \text{ L}} \times \frac{1 \text{ mol LiOH}}{1 \text{ mol HNO}_3} = 0.00206 \text{ mol LiOH}$$

$$M_{\text{LiOH}} = \frac{0.00206 \text{ mol LiOH}}{0.0250 \text{ L}} = 0.0823 \text{ M}$$

9) Determine the molarity of an H₂SO₄ solution if 25.0 mL of the solution is neutralized by 48.13 mL of 0.187 M KOH solution. [See problem 3c for the balanced equation.]

$$? \text{ mol H}_2\text{SO}_4 = 48.13 \text{ mL KOH} \times \frac{0.187 \text{ mol}}{1000 \text{ mL}} \times \frac{1 \text{ mol H}_2\text{SO}_4}{2 \text{ mol KOH}} = 0.00450 \text{ mol H}_2\text{SO}_4$$

$$M_{\text{H}_2\text{SO}_4} = \frac{0.00450 \text{ mol H}_2\text{SO}_4}{25.0 \text{ mL}} \times \frac{1000 \text{ mL}}{1 \text{ L}} = 0.180 \text{ M}$$