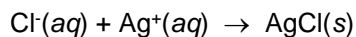


AP Worksheet 4f (Titration)

1. Calculate the concentration of a phosphoric acid solution if 45.0 mL of it were required to neutralize 20.8 mL of 0.532 M sodium hydroxide. Assume complete ionization of the acid.

2. If 0.664 g of an unknown acid were required to neutralize 10.0 mL of 0.800 M NaOH, calculate the molar mass of the acid given it reacts with sodium hydroxide in a 1:2 ratio, i.e., 1 acid : 2 NaOH.

3. 3.364 g of hydrated barium chloride, $\text{BaCl}_2 \cdot x\text{H}_2\text{O}$, was dissolved in water and made up to a total volume of 250.0 mL. 10.00 mL of this solution required 46.92 mL of $2.530 \times 10^{-2}\text{M}$ silver nitrate for complete reaction. Calculate the value of x in the formula of hydrated barium chloride, given the net ionic equation for precipitation below.



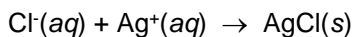
*Steps for problem 3 on website

**Slightly simplified version of problem 3 on website

*** Slightly simplified version of problem 3 with steps on website

AP Worksheet 4f* (Titration)

1. Calculate the concentration of a phosphoric acid solution if 45.0 mL of it were required to neutralize 20.8 mL of 0.532 M sodium hydroxide. Assume complete ionization of the acid.
2. If 0.664 g of an unknown acid were required to neutralize 10.0 mL of 0.800 M NaOH, calculate the molar mass of the acid given it reacts with sodium hydroxide in a 1:2 ratio, i.e., 1 acid : 2 NaOH.
3. 3.364 g of hydrated barium chloride, $\text{BaCl}_2 \cdot x\text{H}_2\text{O}$, was dissolved in water and made up to a total volume of 250.0 mL. 10.00 mL of this solution required 46.92 mL of $2.530 \times 10^{-2}\text{M}$ silver nitrate for complete reaction. Calculate the value of x in the formula of hydrated barium chloride, given the net ionic equation for precipitation below.



Step 1: Write a molecular equation for the reaction of barium chloride with silver nitrate

Step 2: Perform a titration calculation to determine the number of moles of barium chloride present in the reaction of 10.0 mL of the barium chloride solution

*Step 3: Create a ratio comparing the number of moles of barium chloride in 10.0 mL of the solution with the number of moles that would be present in the 250.0 mL solution (THIS STEP IS NOT PART OF ** VERSION)*

Step 4: Calculate the mass of barium chloride from the moles in the 250.0 mL solution

Step 5: Determine the mass of water in the hydrated sample

*Steps for problem 3 on website

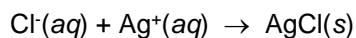
**Slightly simplified version of problem 3 on website

*** Slightly simplified version of problem 3 with steps on website

Step 6: Use the mass of anhydrous barium chloride and the mass of water to determine the formula of the hydrate.

AP Worksheet 4f** (Titration)

1. Calculate the concentration of a phosphoric acid solution if 45.0 mL of it were required to neutralize 20.8 mL of 0.532 M sodium hydroxide. Assume complete ionization of the acid.
2. If 0.664 g of an unknown acid were required to neutralize 10.0 mL of 0.800 M NaOH, calculate the molar mass of the acid given it reacts with sodium hydroxide in a 1:2 ratio, i.e., 1 acid : 2 NaOH.
3. 0.1346 g of hydrated barium chloride, $\text{BaCl}_2 \cdot x\text{H}_2\text{O}$, was dissolved in water and made up to a total volume of 10.00 mL. This solution required 46.92 mL of $2.530 \times 10^{-2}\text{M}$ silver nitrate for a complete reaction. Calculate the value of x in the formula of hydrated barium chloride, given the net ionic equation for precipitation below.



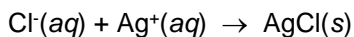
*Steps for problem 3 on website

**Slightly simplified version of problem 3 on website

*** Slightly simplified version of problem 3 with steps on website

AP Worksheet 4f*** (Titration)

4. Calculate the concentration of a phosphoric acid solution if 45.0 mL of it were required to neutralize 20.8 mL of 0.532 M sodium hydroxide. Assume complete ionization of the acid.
5. If 0.664 g of an unknown acid were required to neutralize 10.0 mL of 0.800 M NaOH, calculate the molar mass of the acid given it reacts with sodium hydroxide in a 1:2 ratio, i.e., 1 acid : 2 NaOH.
6. 3.364 g of hydrated barium chloride, $\text{BaCl}_2 \cdot x\text{H}_2\text{O}$, was dissolved in water and made up to a total volume of 250.0 mL. 10.00 mL of this solution required 46.92 mL of $2.530 \times 10^{-2}\text{M}$ silver nitrate for complete reaction. Calculate the value of x in the formula of hydrated barium chloride, given the net ionic equation for precipitation below.



Step 1: Write a molecular equation for the reaction of barium chloride with silver nitrate

Step 2: Perform a titration calculation to determine the number of moles of barium chloride present in the reaction of 10.0 mL of the barium chloride solution

Step 4: Calculate the mass of barium chloride in the solution

Step 5: Determine the mass of water in the hydrated sample

Step 6: Use the mass of anhydrous barium chloride and the mass of water to determine the formula of the hydrate.

*Steps for problem 3 on website

**Slightly simplified version of problem 3 on website

*** Slightly simplified version of problem 3 with steps on website