

Measurement of Chloride in Local Water Samples

PART 1 – ANSWER PRE-LAB QUESTIONS (3 points)

Read the introduction/background information at the beginning of the experiment instructions (found in your supplement and the Chloride Lab Activity folder). Then answer the following pre-lab questions:

1. List two reasons why it is important to monitor chloride concentrations in the environment.
2. Which anthropogenic (human caused) sources of chloride would you expect to be important in an urban area, like Madison, WI? Which anthropogenic sources would you expect to be important in rural areas of Wisconsin?
3. IMPORTANT: Make a prediction. Which water sample in our experiment do you expect to have the highest concentration of chloride? Which do you expect to have the lowest? Why (consider possible sources)?

PART 2 – REVIEW PROCEDURE AND WATCH VIDEO OF TITRATION

Read the experiment instructions and watch the video (5 min) in the Chloride Lab Activity folder.

PART 3 – COMPLETE DATA ANALYSIS WITH PROVIDED DATA (6 points)

Observations:

Water Sample	Sample Volume (mL)	Average Volume of AgNO ₃ Titrant (mL)
Madison College Tap	100.0	9.63
Nine Springs Effluent	25.0	22.21
Lake Mendota	100.0	17.17

Perform the following calculation. *Please show your work clearly and organize your calculations using dimensional analysis.*

$$\text{Volume AgNO}_3 \xrightarrow{0.010\text{ M AgNO}_3} \text{moles AgNO}_3 \xrightarrow{\text{mole ratio}} \text{moles Cl}^{1-} \xrightarrow{\div \text{ sample volume}} \text{Conc Cl}^{1-}$$

Step 1. Calculate moles of AgNO₃ used to react Cl¹⁻. *Hint: Use the concentration of the AgNO₃ solution (0.010 M) and the average volume added (in L))*

Step 2. Calculate moles of Cl¹⁻ reacted. *Hint: The chemical equation for the reaction of chloride with silver nitrate shows a 1:1 molar ratio between AgNO₃ and Cl¹⁻: $\text{AgNO}_3(\text{aq}) + \text{Cl}^-(\text{aq}) \rightarrow \text{AgCl}(\text{s}) + \text{NO}_3^-(\text{aq})$*

Step 3. Calculate concentration of Cl¹⁻ (in units of moles/L) *Hint: Use your calculated moles of Cl¹⁻ from Step 2 and the volume of the water sample (in L) used in the titration.*

Remember, the calculation needs to be completed for each of the three water samples!

PART 4 – ANSWER POST-LAB QUESTIONS (6 points)

1. Which water sample that the class tested has the highest concentration of chloride? Which has the lowest? How do your results compare with the predictions you made? Explain.
2. Convert the concentration of chloride for each sample the class tested from units of molarity (moles per liter) to mg/L (1 mole chloride = 35.45 g). Chloride has negative impacts on aquatic wildlife at 210 mg/L. Write 1-2 sentences explaining whether or not the chloride concentrations in the tested water samples are cause for concern.

3. For the class next semester, your instructor is planning to collect additional water samples from three streams: one in a pristine mountain area with no cities or farms nearby, one surrounded by corn fields near a large dairy farm, and one in an urban area where snow melt from the roads and treated wastewater are discharged into the stream. Answer the following questions about what you would expect to find in these samples:
- a. Which sample is likely to have most chloride? Least chloride? Why (consider possible sources)?
 - b. Based on your answer to part a, which sample will require the most AgNO_3 for the titration? Why? Write 1-2 complete sentences.
4. If you used NaNO_3 instead of AgNO_3 would the titration still work? Why or why not? Write 1-2 complete sentences to explain your answer.