

SEAWATER ANALYSIS

The final two weeks of this course will be the capstone analysis of seawater samples (collected by you!). In this final project, each pair of students will be assigned a technique for measuring the concentration of one or two ionic species found in seawater. In this project, you are asked to (i) research the technique, (ii) come up with a procedure for using this technique to measure a property of the seawater samples, (iii) test this procedure on standard solutions that you have selected as well as synthetic seawater provided by the stockroom, and (iv) provide analyses for a series of seawater samples collected by your classmates.

Procedures

Part A: Initial Preparations (beginning Week 5)

Each lab pair will be assigned a particular type of measurement that will be used to analyze one or two types of ions in seawater. The measurement types:

1. Turbidity Measurements for Sulfate
2. Turbidity Measurements for Potassium
3. Sulfate Complexometric Colorimetry with Methylthymol Blue
4. Magnesium Complexometric Fluorometry with 8-hydroquinoline
5. EDTA titrations for Magnesium and Calcium
6. AgCl Precipitation titration for Chloride

Your group will be assigned one of these six measurements. You then must:

1. Determine what ion concentration range you expect to observe.
2. Explain how the technique measures these ions and with what sensitivity (this includes some web research and gathering documents/protocols; the TAs can help you).
3. Create a list of chemicals and equipment that you will need for the experiments. These lists will be compiled by the TAs and given to the stockroom.

Your first task is to create a PreLab document due **Week 6** for your experiment in order to let the stockroom know what chemicals and laboratory equipment you will need. For more details, please see the “Seawater PreLab” link under Week 6.

Part B: Testing Your Procedure (Week 7)

This week, you will need to complete the following work:

1. Create standards and/or calibration curves for your samples.
2. Perform test measurements using the standard seawater sample to make sure that your methodology works.
3. Write down all of the details needed to write a clear, complete procedure for your analysis.

As a place to start, ask yourself the following questions:

1. What type of measurements do I need in order to make standards and/or a calibration curve for this measurement technique?
2. What concentration range do I expect to measure in seawater? Over what concentration range does my analytical technique work? (The answers to these questions will vary if you are using a Vernier spectrometer, a pH meter, etc.).
3. What other cations or anions in seawater will interfere with my measurements? How can I remove those interferences?
4. How many samples will I be able to measure in a laboratory class period?

Part C: Analysis of Seawater Samples (Week 8)

This week, having finished the calibration curves and initial procedure tests, you are ready to make careful measurements of some real seawater samples. Please bring a 1.0 L bottle of seawater to add to the samples to be analyzed.

The seawater samples will probably need some pre-processing before your analysis. Take a look at the seawater samples and ask yourself the following questions:

1. If the seawater is not cloudy, can you use ultraviolet–visible absorption spectroscopy?
2. What other pre-processing steps are necessary, e.g. pH, ionic strength, filtration, ion exchange?
3. Compare with standard seawater samples and other techniques/groups to see if you are getting reasonable numbers.

Part D: Seawater Analysis Report

For details on your report, please see the PostLab document for the Seawater analysis. Ask your TA for the due date.