

# Analytical Chemistry

## What's in the Water?



Heather Wiley

Chemistry and Forensics teacher at  
Bettendorf High School

2021 extern at QC Metallurgical Labs

## Part I: Overview of Workplace

Q.C. Metallurgical Laboratory opened in 1983 and performs mechanical and chemical testing. They specialize in conducting failure analysis and determination of the composition of materials.



## Part II: Workplace Focus

The chemical analysis at QC Metallurgical involves many machines and instruments to determine qualitative and quantitative analysis of the composition of materials. Customers send in samples that they want to determine the metallurgical composition of or to know the amount of ions or heavy metals present in various samples.



Preparing the samples for analysis includes digestion in microwave digestion, open digestion and quality control. Instruments are in place to ensure reliability of the tests.



## Part III: Introduce the Problem

Is the water safe to drink?

Students will bring in water samples from various sources in the community and test the samples for the presence of different metal ions to determine if it is potable. They will report to the company that commissioned them to determine the safety of their drinking water.



Student tests for ions will use precipitation reactions rather than spectroscopy and other instrumentation used at my externship, but the premise of the analysis is similar. The capabilities of the advanced instruments along with the concepts of quantitative testing and environmental limits will be part of the unit content.

## Part IV: Standards, Driving and Essential Questions

The NGSS standard that this unit aligns with is:

2-PS1-2 Matter and its Interactions: Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

Analyze data from the testing of the water samples to determine which materials have the properties that are suited for certain purposes such as drinking and cooking.

Essential questions:

What substances can be in drinking water that could make it dangerous to consume? What levels are acceptable? Who establishes these levels and what are the results of too much of specific ions? How can the presence of different substances be tested? What can be done if levels are too high?

## Part V: Extern Host Role

Brandon Keleher

Analytical Chemist

QC Metallurgical Laboratory Inc.

Brandon will send an email to my students requesting analysis of the water samples. Their reports will be emails to him as the “customer” that contracted them to analyze their water sample and determine which metal ions were present in it.

## Part VI: Student Learning

Sources and dangerous levels of substances in drinking water and their effects will be studied before the lab as well as investigation of water testing methods. I will let the students decide if their group will each test for each of the ions and compare their results or if they will split up which people are testing for which ions. Groups can compare pros and cons regarding these procedures. The value of repeating experiments, conferring with colleagues, and establishing positive controls to gain confidence in results will also be discussed. If they get any conflicting results, groups can determine how to handle the discrepancies. Reflection of safety precautions, methodology, group dynamics and effectiveness can all be a part of the journals and a final report will be produced with their results for their “clients” along with an analysis of potability.