

# Analysis of Water Laboratory:

## Veatta Berry

### Teacher's Guide

#### Goals

- To practice chemical analysis of water samples
- To do real life environmental studies

#### The Laboratory

In this laboratory, students go to a nearby lake, and measure the water's content and quality. They measure several parameters, such as chemical content, pH, depth and so on. The students use both portable and laboratory equipment and learn about the chemistry of the environment.

#### Materials for Each Group

- A meter stick
- pH sticks
- Phosphate, nitrate, nitrite, and chloride chemical tester kits (HACH Co.)
- 500 ml water bottle
- Distilled water
- Markers and stickers
- Plastic box to carry these materials
- Temperature meter
- Oxygen measurement kit: methylene blue indicator solution, 20 ml test tubes, test tube rack, stop watch
- Apparatus for phosphate measurement in soil is described in:

Storer, D.A.; Sarquis, A. M. (2000) "Measuring Soil Phosphates Using Ion-Exchange Resins: A Final Project for Freshman Chemistry," *Journal of Chemical Education*, Vol. 77, p: 748. Complete description and handouts for the experiment may be found in the supplement for this paper.

See also the teacher's guide at [http://archive.globe.gov/globe\\_flash.html](http://archive.globe.gov/globe_flash.html). The GLOBE program is a world-wide authentic science program in which students take measurements—of water, land, etc.—in their own locale and report the data on the Web. Enter the GLOBE site and click on "Teacher's Manual" on the left for activities.

#### Comment

For measurements of chemical composition of water, there exist both indicator sticks and portable sensors. Ask your nearby dealer for these products.

#### Lecture Notes

I gave each group a set of directions for when they're down at the lake.

You will share the information with other groups, and you are going to analyze only one of the tests, so each group is in charge of one test.

For each landmark around the lake you are getting different chemicals that may be washed into the lake: from a parking lot you can get grease, from a house you can get fertilizers, etc.

### Teaching Tips From Ms. Berry

In this exercise, groups collect samples from different sites around the lake, and when they get back, they have six different tasks that they have to perform for finding out how much phosphate and nitrate is in the water, as well as how much organic and inorganic sediment is found.

Then, they are going to share their data, and each group will report one thing, for example, phosphates: how they get into the water and why they are there. They are going to get their data from the other groups.

I would like to see the students relating what we have done all semester (what are chemicals, taking samples, testing in the lab) to everyday life.

I like to show them how a field study is done, and how you would pre-rinse your bottle with the water that you are actually collecting.

As we go along with the study, we talk about how we can get really good results. We would have to go back to the lake several times and do a timed study, and see how things might change with the seasons. They can't do that; we can just give them a taste of what it's like.

That's one thing about teaching environmental science, that we don't have control over the situation and sometimes we are both looking for the answer.

They are doing an end-up study on one of the tests, and presenting it with Power Point. They will get a feeling for the background research for all of the tests by presenting it to each other.

### References: Links

[http://archive.globe.gov/globe\\_flash.html](http://archive.globe.gov/globe_flash.html)

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[http://inlet.geol.sc.edu/level\\_1.html#3.1A](http://inlet.geol.sc.edu/level_1.html#3.1A)

Activities related to the chemistry of solubility and water quality.

### References: Readings

Kelter, P.B., Grundman, J., Hage, D.S., Carr, J.D., and Mauricio, C. (1997) "A Discussion of Water Pollution in the United States and Mexico; With High School Laboratory Activities for the Analysis of Lead, Atrazine, and Nitrate," *Journal of Chemical Education*, Vol. 74, No. 12, pp: 1413-1421.

Randall, Jack. (1997) "Integrating High School Chemistry With Environmental Studies and Research," *Journal of Chemical Education*, Vol. 74, p: 1409.