WATER QUALITY PRE/POST LAB ACTIVITIES

Discussion: (Possibly use groups, with each group having a recorder and presenter.)

1. Why would you want to monitor water quality in the ocean? Isn't all ocean water the same? Why not?
2. Where else is water quality monitored? Why?
3. Why does the increase in water temperature decrease the amount of oxygen in the water?
4. Why did we use E. Coli in our lab?
5. Have students discuss in groups the three experiments and what they showed.
6. Have students discuss how to make the labs better. What did they like best about the lab? What parts were the hardest to understand. How could we improve the labs for next year?
7. In the working world, who would want to test water and why?
8. What else could we do with what we have learned?

Written or Discussion:

Place one Alka-seltzer in a glass of warm water and one in a glass of cold water and have the students write or tell you what they observe, why it is happening the way it is, and which of the three labs most closely relates to this activity. (Use the Coke for pre -lab.)

Written and Presentation:

Students may do research in the library, bring in articles on water treatment, L A. River Project, etc.

Have students do research on water treatment:

- How is water treated for E. Coli?
- What has been learned about E. Coli and how could water be treated to kill E. Coli?
- What are the stages of water treatment?
- Why are some treatment plants only primary and others secondary and tertiary. What is the difference and why?

Post-lab Application Operation::

- Students may work on L. A. River Project or do a class project to help clean up a water area for classroom credit.
- Take a field trip to a water treatment plant.

- Post a map of Southern Calif. and locate the water treatment plants. Identify them as primary, secondary, tertiary.
- Collect our own water samples looking for other living organism and move into microbiology and classification of single cell organisms living in water.
- Students may examine an aquarium filter or other types of filters and its contents and move into filtration of water for safety, taste, pH.
    - Have the students filter water containing microorganisms through sand and other materials to see what is filtered out.
    - Have students filter water through different materials to change the pH.
    - Have students mix microorganisms and observe which survives and discuss how this is used to break down solid waste.

Teacher's Imagination:

Set up a secondary waste treatment experiment in the classroom:
(I may try this in my garage this summer. How bad will it stink?)

1. Use a small aquarium or fishbowl.
2. Lab animal droppings, bits of food of various types.
3. Strong air pump, air stone and adjustable valve.
4. Bacteria to break down solid waste of lab animals. (to be obtained from a water treatment plant)
5. Follow the procedure a secondary treatment plant follows.
6. Test with Millipore filters before chlorination and after.

WATER QUALITY POST LAB ACTIVITY

The students have had experience with the D.O. meter, pH meters and the Millipore filtration system. They will use this apparatus to test some local water samples.

Each student is to go out and collect three samples of water from three different local sites. They will bring in these samples and run tests to determine:

a. Dissolved oxygen measurements with the addition of yeast cells
b. pH measurements of the water alone
c. Bacterial (coliform and non-coliform) colonies counts.

After recording this data, they will graph the D.O. values. They will have to tally their results of the acidity of their samples and give possible explanations of the different acid levels. Finally, they will tally their bacterial colonies and give some suggestions as to what is supporting this colonial growth.

As an additional comparison, you may want to have the students compare their results because, chances are, they may have collected samples from a common source. If they have significantly different values, they may try to account for this difference (i.e. was it collected from shallow or deeper sources, was it collected on the same day, before or after a rain, night or day, etc.)

Name _____
Period _____
Date _____

WATER QUALITY LAB POST QUIZ

1. If you were to rewrite the purpose of this lab, how would you write it?
2. We used yeast in this lab and the yeast consumed the milk. If this were a natural situation, what component would the milk be?
3. How do you think your graph in Part I would change, if at all, if we were to eliminate the 40 C water bath?
4. In July there will be a huge sewage spill into one of the major water reservoirs that supplies the Los Angeles area. Could we add yeast to the water to aid in the clean up process?
    A. Explain some of the advantages of this procedure.
    B. Explain some of the disadvantages of this procedure.
5. In what industry would you see the D.O. meter as an essential piece of equipment? What would be some tests run with this meter in that industry?
6. Why does the Department of Water accept minimal amounts of bacterial growth rather than insisting on ZERO growth?

WATER QUALITY LAB: FOLLOW- UP ACTIVITY

1. In your groups, examine the following data from Lagoon Elsie of temperature differences, Coliform development, oxygen content, and wildlife. The lake is situated 20 miles from a major city. Up the river about 20 miles Factory O'Neil, a steel plant, adds about 200 million gallons of industrial water to the river. A major resort is planned to be built next to the lagoon. Decide if this development should be blocked to save the lagoon, or if the ecosystem looks stable enough for building.

Area of Lake	**Coliforms/100 mL**	**Dissolved Oxygen**	**Temperature °C**	**Number of salt bush/m²**
Inlet	1500	6.0	25°C	1.2
Lagoon	2000	4.3	30°C	3.4
Outlet	1500	5.5	21°C	0.6

2. For each column, tell how data was collected and what the significance of the data is. Highlight any areas of possible endangerment. Be prepared, as environmentalists, to detail why we should care about this.

3. For these problem areas you have identified from the data, come up with some "goal numbers", i.e. numbers which would be acceptable to the community, and how they might be achieved.

4. Research possible other solutions for this problem including removal of water treatment plants from endangered areas, allotting more space for the wetland lagoon, and stricter regulation of waste dumping from Factory O'Neil.

WATER QUALITY POST LAB

This lab like many of the other labs can be incorporated into any number of the units of study. Reference to the labs' processes and/or outcome can be continued throughout the year and hopefully many years to follow:

ECOLOGY UNIT

1. Test the quality of water in:
    A. Swimming Pools
    B. Oceans
    C. Ponds
    D. Standing water
2. Become familiar with the legislation passed or pending (for pending legislation, start a "letter writing" campaign).
3. Learn to read and get information from Water Quality reports.

HUMAN BIOLOGY UNIT

1. Test the bacteria content in:
    A. Saliva
    B. Sinks/Tubs/and Showers in your home
    C. Drinking water
    D. Bottled water
    E. Laundry water

CELL UNIT

1. Importance of water and osmosis or the functioning of cells.

CHEMISTRY UNIT

1. Chemical components of polluted water.
2. The processes of metabolic procedures (also in Cell Unit).

CLASSIFICATION UNIT

1. Water and the Habitat of the Simple Organisms and how the quality of their surrounding affects them.
2. Habitat of "fish tank"
3. Habitat of bacteria

BOTANY UNIT

1. The quality of the water for plant functions.

HOW POTABLE IS YOUR WATER SAMPLE

Water quality management is important in taking care of the environment and in ensuring the health of humans and other organisms, respectively. Scientists have developed methods and tools to achieve this goal. We have experimented with many of these processes. The concept of concentration and how to alter it is very important to a member of a scientist in the water quality team.

Answer the following questions and perform the activity below:

QUESTIONS:

1. What is meant by ppm?
2. What is meant by ppb?
3. What is the usual method of killing pathogenic bacteria and viruses after secondary and tertiary treatment of the waste water?

ACTIVITY:

Another possible method of getting rid of pathogens is dilution.

1. Before starting, make sure you obtain the following data from part III of the lab:

   Count of coliform bacteria
   _____

   Count of non-coliform bacteria _____

   Total count of bacteria
   _____

   % of coliform bacteria
   _____

   % of non-coliform bacteria _____

2. Obtain five 100 mL beakers and label them #1 through #5.
3. Prepare the 5 beakers in order, as indicated in the chart which follows, and record the count and % of bacteria found in each test.

Beaker #	Component A (mL)	Component B (mL)	Coliform Bacteria	Non-coliform	Total Bacteria	Coliform Bacteria	Non-coliform

				Bacteria	**%**	**%**	**Bacteria**
1	5 mL Sample Water	45 mL Tap Water					
2	5 mL from Beaker 1	45 mL Tap Water					
3	5 mL from Beaker 2	45 mL Tap Water					
4	5 mL from Beaker 3	45 mL Tap Water					
5	5 mL from Beaker 4	45 mL Tap Water					

4. Filter each new beaker and place the gridded filter paper in petri dishes as described in part III of your lab.
5. Incubate the petri dishes overnight, then complete the chart with the appropriate data.

ANALYSIS: Answer the following questions.

1. In beakers # 1-5, you performed a serial dilution in order to obtain varying concentrations of bacteria in water. By what factor was each concentration reduced?
2. Do your bacterial counts reflect the reduction?
3. Looking at the Crescenta Valley County Water District Annual Water Quality Report for 1993, does any of your data on the concentration of bacteria meet the County's parameter?
4. As a member of the water quality analysis team, what recommendations would you make in regards to the potability of the water you sampled?

Water Quality Lab Quiz

Part 1:

1. What was the control in this experiment?
2. Which solutions changed color ? What caused the color change in these solutions?
3. Why did the yeast solutions change color faster in the hot water bath?

Part 2:

4. Why does the analytical balance have to be "zeroed" with the measuring tray before weighing out the yeast?
5. What do you think would happen to the rate of reaction if you doubled the amount of yeast in the experiment?
6. Can yeast survive in oxygen-poor water? Why or why not?

Part 3:

7. Filtration separates mixture based on _____.
8. What purpose does the endobroth serve in this experiment?
9. If the results are as shown below, was the water safe to drink?