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Escaping Oxygen Introduction

Discovery Question: Does the amount of oxygen dissolved in water change if the temperature changes?



This activity enables you to change the amount of oxygen trapped in water by varying the temperature of the water.

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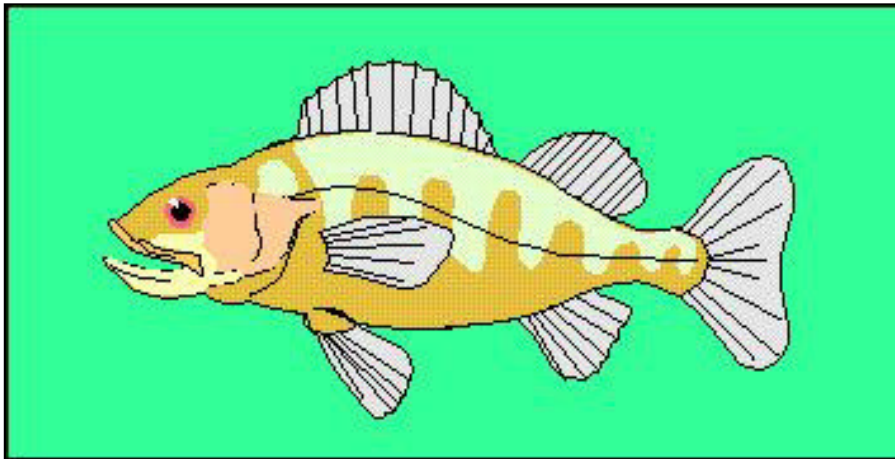
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Thinking About the Question

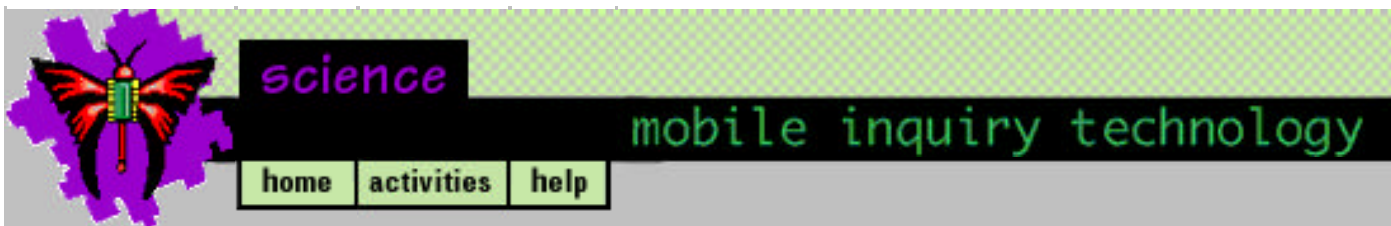
Does the amount of oxygen dissolved in water change if the temperature changes?

You've noticed that that amount of carbon dioxide dissolved in soda seems to vary with changes in temperature. You know that you need oxygen to breathe. Fish and other critters that live in water also depend on oxygen. Many of you have suggested that fish breathe oxygen that is dissolved in the water. What evidence can you give to support this idea? Discuss this with your group.



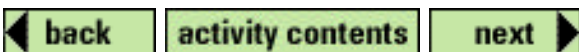
Does the amount of oxygen dissolved in water affect the fish? What environmental conditions might affect the amount of oxygen dissolved in water in the ocean and in ponds and streams? What do you think would happen to fish if the amount of oxygen got too low?

Predict how the amount of oxygen dissolved in water might change with an increase in temperature of the water. Discuss this with your group. Be prepared to explain your reasons to the class.



Escaping Oxygen Materials

- dissolved oxygen (DO) probe
- large container or bucket of (aerated) water
- hot plate and container suitable for boiling water
- aquarium aerator
- thermometer
- Styrofoam cup
- heating source

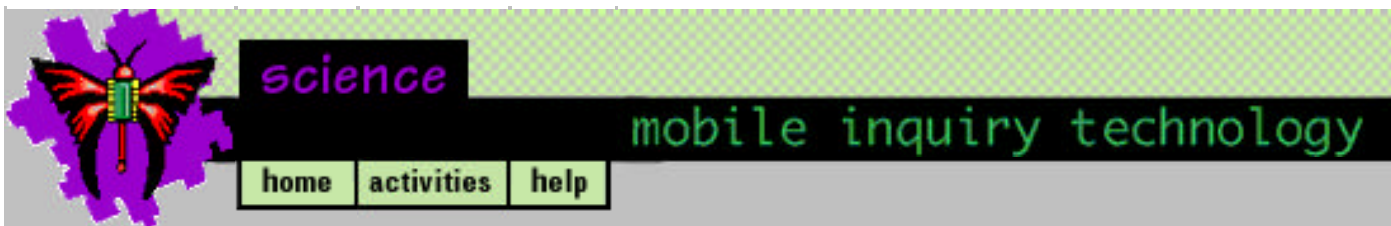




Escaping Oxygen Safety

Be careful while handling hot water.



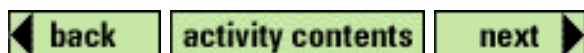


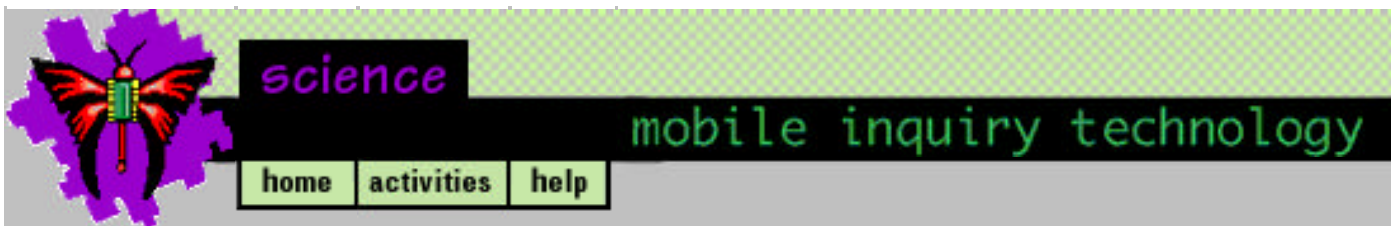
Escaping Oxygen Investigation I

Finding the amount of oxygen in room temperature water

Your teacher will have a bucket of aerated water at room temperature that you will use for your investigations. Your teacher aerated the water by bubbling (forcing) air into the water overnight with an aquarium air pump.

1. Create a spreadsheet for recording dissolved oxygen and varying temperatures including the room temp (water), warm temp (water), and hotter temp (water) . Refer to [Technical Hints](#) to see how to create a spreadsheet.
2. Obtain a Styrofoam cup of heated water from your teacher. Be careful to hold the cup so that it doesn't tip. The thermometer will make the Styrofoam cup top-heavy. Take the temperature of the water.
3. After connecting the dissolved oxygen probe to the computer, measure for thirty seconds the amount of dissolved oxygen found in the room temperature water with the DataLogger software. Refer to [Technical Hints](#) to see how to use the DataLogger software to measure dissolved oxygen.
4. Transfer the final dissolved oxygen measurement for room temperature water to your spreadsheet. Refer to [Technical Hints](#) to see how to transfer data to a spreadsheet.



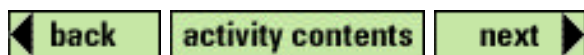


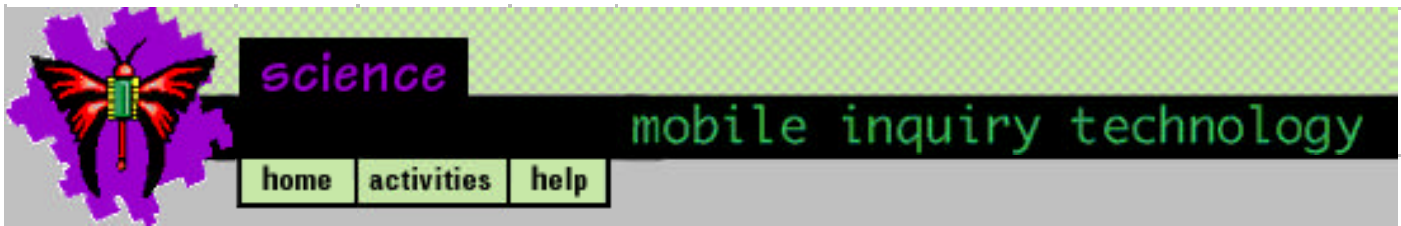
Escaping Oxygen Investigation II

Finding the amount of oxygen in heated water

Observe as your teacher takes some water from the same bucket used for "Investigation I". Your teacher will heat some of this aerated water for the next investigation.

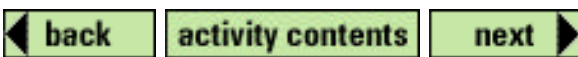
1. Obtain a Styrofoam cup of heated water from your teacher. Be careful to hold the cup so that it doesn't tip. Both the thermometer (and the dissolved oxygen probe) will make the Styrofoam cup top-heavy. Take the temperature of the water. Record this temperature on your spreadsheet for the warm water.
2. After connecting the dissolved oxygen probe to the computer, measure for thirty seconds the amount of dissolved oxygen in the warm water with the DataLogger software. Refer to [Technical Hints](#) to see how to use the DataLogger software to measure dissolved oxygen.
3. Transfer the final dissolved oxygen measurement for the warm water to your spreadsheet. Refer to [Technical Hints](#) to see how to transfer data to a spreadsheet.
4. Obtain a Styrofoam cup of hotter water from your teacher. Take the temperature of the water. Record the temperature on your spreadsheet for the hotter water. Be careful to hold the cup so that it doesn't tip. After connecting the dissolved oxygen probe to the computer, measure for thirty seconds the amount of dissolved oxygen in the hotter water with the DataLogger software. Refer to [Technical Hints](#) to see how to use the DataLogger software to measure dissolved oxygen.
5. Transfer the final dissolved oxygen measurement for the warm water to your spreadsheet. Refer to [Technical Hints](#) to see how to transfer data to a spreadsheet.
6. Complete the questions found in "Analysis".





Escaping Oxygen Technical Hints

- [Creating a spreadsheet](#)
- [Using the DataLogger software to measure dissolved oxygen](#)
- [Transferring data to a spreadsheet](#)
- [Creating an x-y line graph](#)



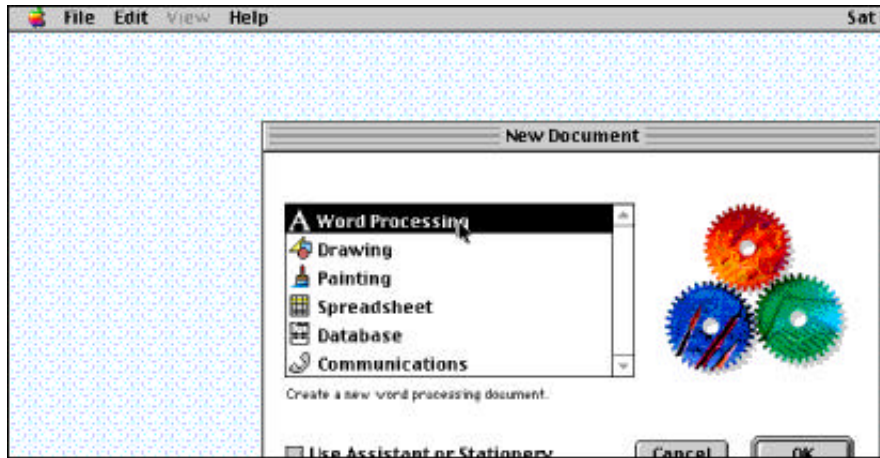


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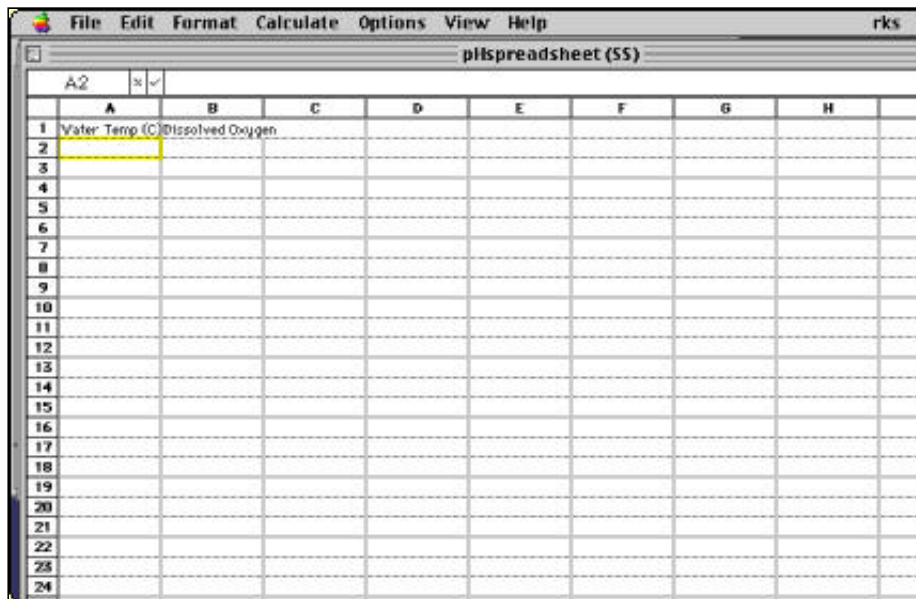
Escaping Oxygen Technical Hints

To create a spreadsheet:

1. Select the spreadsheet option in ClarisWorks.



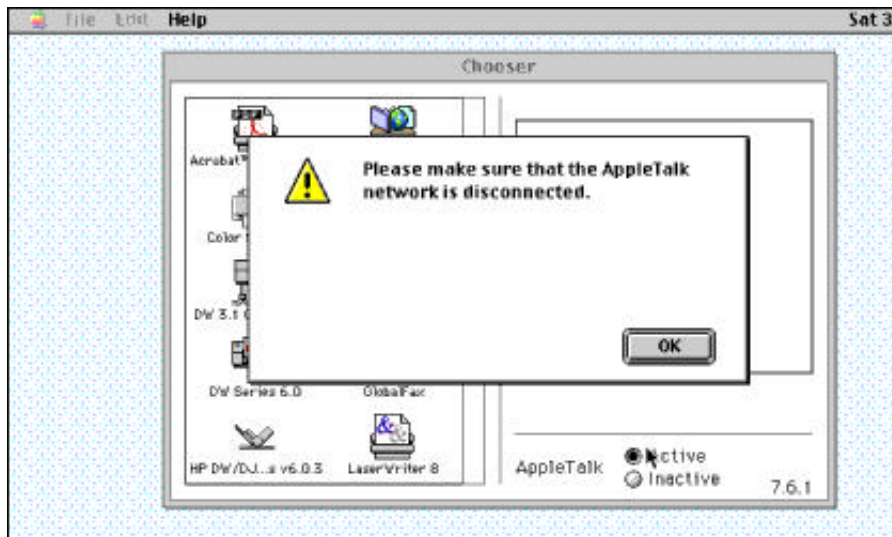
2. Type the water temperature (including room and three increasing warmer temperatures) in Column A. Type dissolved oxygen in Column B.



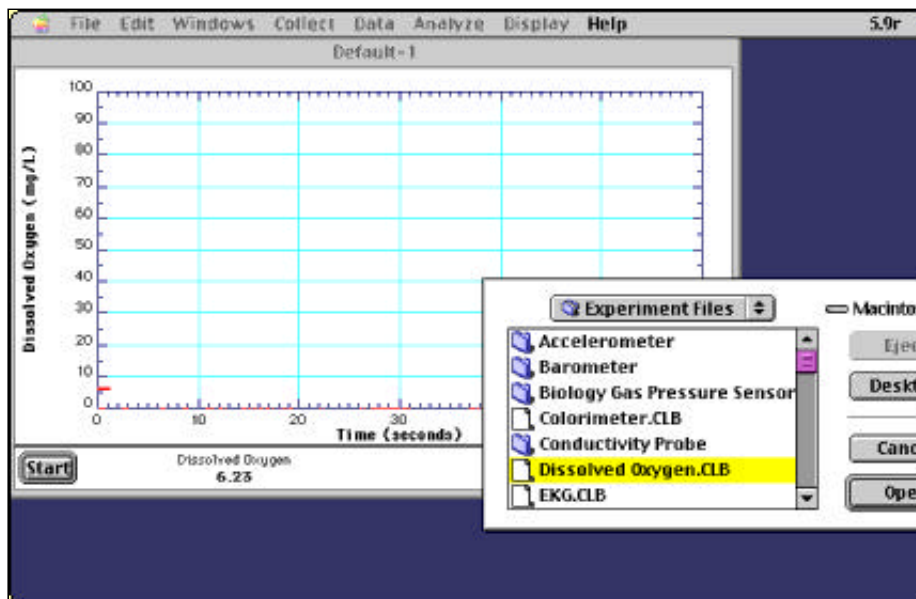


To use the DataLogger software to measure dissolved oxygen:

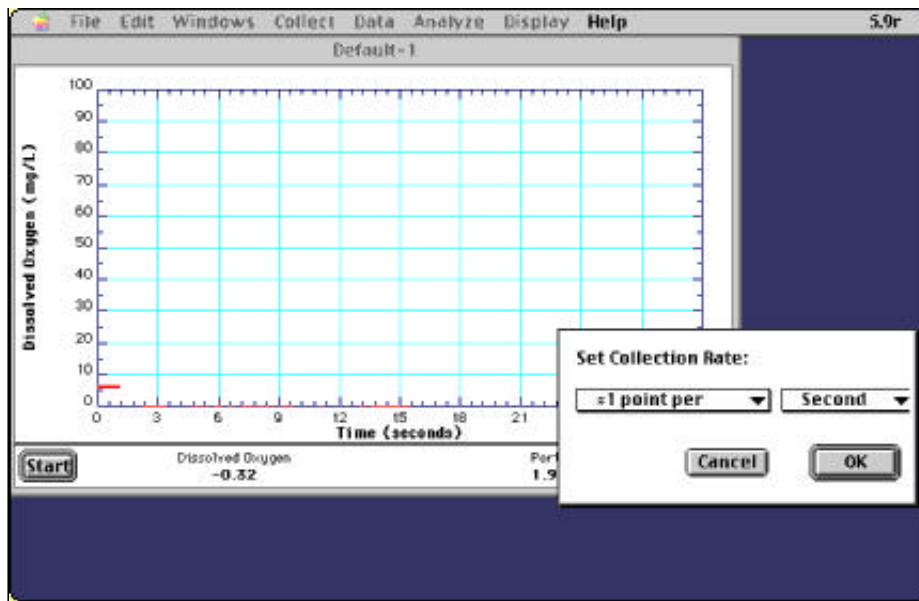
1. Open the Chooser from under the Apple menu. Make sure AppleTalk is inactive.



2. Attach the dissolved oxygen probe to port 1 of the interface box. Connect the serial port at the back of the computer to the modem/printer port.
3. Double click on the DataLogger software. It will automatically open. From the Collect menu choose Calibrate. Select Load Calibration for Just Port #1. From Experiment Files select Dissolved Oxygen.CLB.



4. Select the Collect menu and choose Data Rate. For this activity select 1 point per second.
5. From the Display menu select One Graph. Also from the Display menu choose Set All Min, Max. For this experiment, select 0-30 for seconds. Click OK. Select 0-100 for dissolved oxygen in mg/L. Click OK.



6. Click on Start to begin collection.

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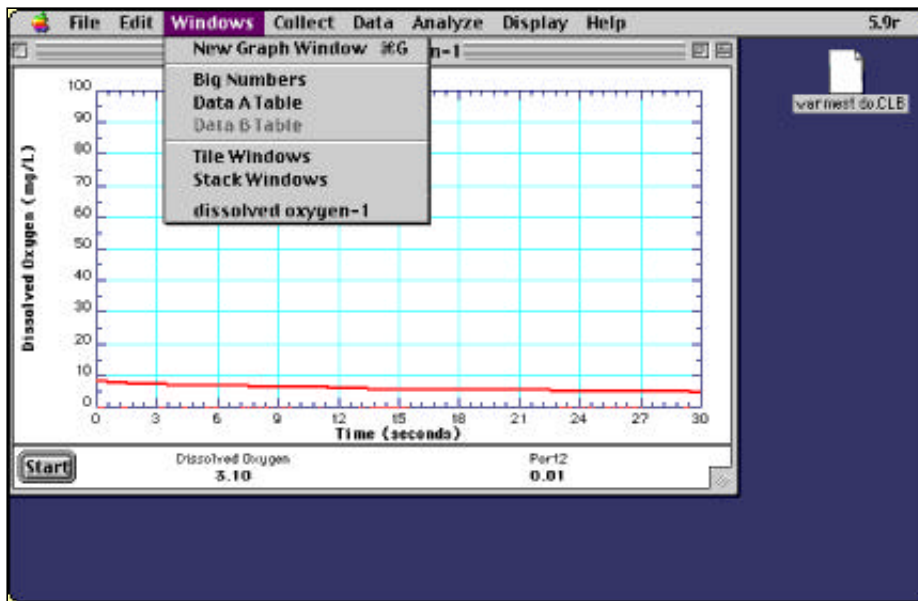


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Escaping Oxygen Technical Hints

To transfer data to a spreadsheet:

1. Select Data Table A from the Windows menu. Highlight the last row of data and press Open Apple and the C key at the same time on the computer.
2. Open your dissolved oxygen spreadsheet. Choose an area away from your chart and press Open Apple and the V key at the same time. Select the room temperature dissolved oxygen and click in the appropriate box. Choose Paste from the Edit menu to place the dissolved oxygen reading. Highlight the original data and click delete.



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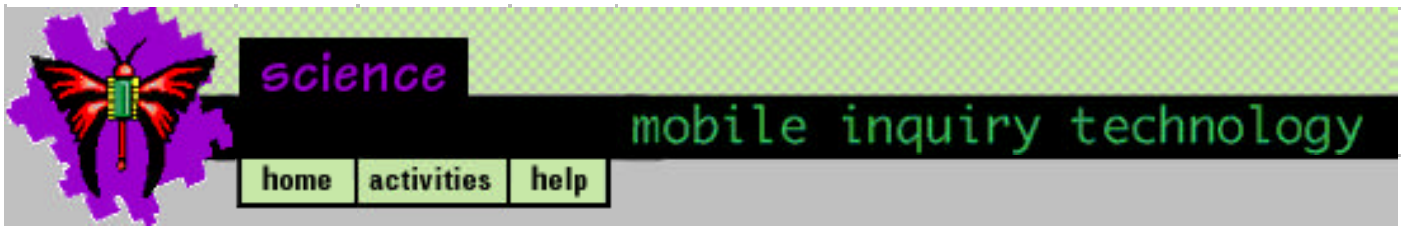
Escaping Oxygen Technical Hints

To create an x-y line graph:

1. Highlight the data that you would like to graph. Include the headings if possible. Select Make Chart from the Options menu. Choose x-y line graph from the Gallery. Click OK.

2. Expand or move the graph by clicking on a corner and dragging to the desired size.



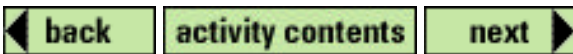


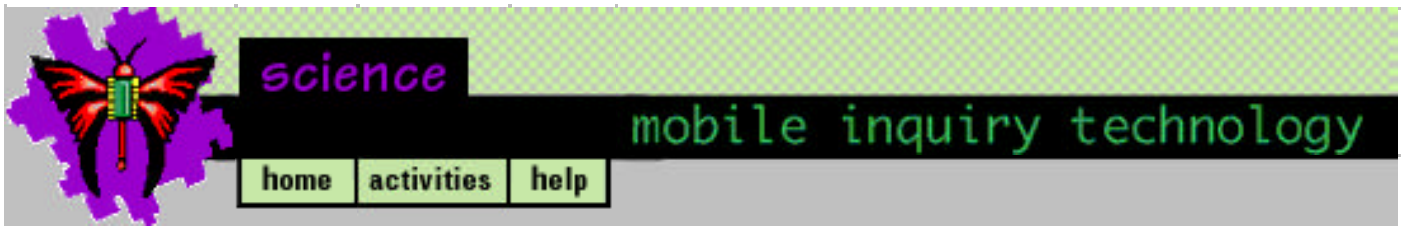
Escaping Oxygen Analysis

1. Create an x-y line graph of the dissolved oxygen versus temperatures. Refer to [Technical Hints](#) to see how to create an x-y line graph.

Answer the following questions on paper:

2. How did the amounts of dissolved oxygen vary with changes in temperature?
3. What conditions in the environment might cause the temperature of natural bodies of water to change?
4. Do you think these changing conditions might affect the amount of oxygen available to fish? Include evidence to support your ideas.





Escaping Oxygen Further Investigation

Design and complete an investigation to determine the amount of oxygen dissolved in progressively colder water.

