

Investigative Lab 34

Life as a Pond Organism

Changes and Interactions in a Pond Environment

Question How do changes in abiotic factors affect organisms living in a pond ecosystem?

Lab Overview In this investigation you will use a microscope to observe various organisms living in a pond water sample and choose one type of pond organism to observe more closely. Then you will change the water temperature or light conditions. You will make observations over time to discover how the life of “your” pond organism changes in response to different environmental conditions.

Introduction In the lab, you will make careful observations of a miniature “pond ecosystem” inside a plastic tube. The plastic tube, called a demo slide culture tube, has a flattened section that allows you to view a small amount of liquid (about 0.2 mL) through a microscope.

Each day, you will tour the ecosystem by scanning slowly back and forth over this flattened section with your microscope. You will observe and draw sketches of the organisms you see. To help you understand how environmental change can affect pond organisms, you will keep a journal of the life of one type of pond organism and describe how its life changes in various conditions of light or temperature.

Background When abiotic factors change, organisms in an ecosystem may be affected. As you change the temperature or light affecting your miniature ecosystem, you will see changes in the population of pond organisms. For example, as the temperature increases, the level of dissolved oxygen in the water decreases. Some organisms may thrive in lowered oxygen levels, but many will die. Changes in the amount of light will cause the numbers of producers (autotrophs) to either increase or decrease, changing the foundation of the ecosystem’s food chain.

Prelab Activity Read and consider the experiment described on the next page. Then answer the Prelab Questions that follow.

On a warm summer day (27°C/80°F), students collected a water sample near the surface of a local pond. After taking the water back to the lab, the students placed equal amounts of water in four different containers, and stored one container in each set of environmental conditions below.

Sample	Light Conditions	Temperature
A	bright light	room temp 21°C (70°F)
B	dark	room temp 21°C (70°F)
C	dark	warm temp 35°C (90°F)
D	bright light	warm temp 35°C (90°F)

Prelab Questions

1. In which of the above-mentioned conditions do you predict most of the organisms in the sample would thrive? Explain your reasoning.
2. Predict how the amount of *light* might affect the autotrophic pond organisms in each container.
3. Predict how the amount of *light* might affect the heterotrophic pond organisms in each container.
4. When the temperature of water increases, the level of dissolved oxygen decreases. With this in mind, answer the following questions.

a. Predict how the *temperature* might affect the autotrophic pond organisms in each container.

- b. Predict how the *temperature* might affect the heterotrophic pond organisms in each container.

Materials

- pond water sample
- 4 demo slide culture tubes
- transfer pipette
- stirring rod
- demo slide culture tube stage
- fluorescent light
- heating pad
- lidded opaque container
(large enough to hold culture tube)
- microscope
- references for identifying organisms
(books; Web sites)

Procedure

Part A: Observing and Selecting Your Pond Organism

1. With a stirring rod, thoroughly mix your sample of pond culture.
2. Using a transfer pipette, fill four demo slide culture tubes, leaving about 1 cm of space at the top of each tube. Flick the flattened section of the tube with your fingers to release the air bubbles.
3. Put the lids on the tubes.
4. Put one of the culture tubes into the demo slide stage and examine the culture under the microscope at low power.
5. Focus the microscope and observe the organisms at low power, medium power, and then high power.
6. Take notes on the organisms you observe. Then choose an organism that is particularly interesting to you, and observe it closely. The organism that you choose should be present in all four culture tubes.

Part B: Writing About Your Pond Organism

1. As you are observing the organism, consider the questions below.

a. What is your organism doing? Observe it for at least 1 min.

b. How is it interacting with other organisms?

c. Is the organism moving? If so, do its movements seem to be for moving from place to place, obtaining food, or both?

d. How does it obtain food? Describe its food.

e. How big is your organism? Use the approximate diameters of the different fields of view to estimate its size.

Low power (40×) = 5 mm or 5000 μm (micrometers)

Medium power (100×) = 2 mm or 2000 μm

High power (400×) = 0.5 mm or 500 μm

f. Is it the most common organism in the culture?

g. Draw a sketch based on your observations.

Name _____ Class _____ Date _____

- 2.** Your teacher will provide resources to learn more about the organism. Include this information in your further writing. Include answers to the following questions.

- a.** Classify your organism. What is its name? What kingdom, phylum, and class is it in? What are some examples of other organisms that are “class” mates?

- b.** How does it obtain food? Does it make its own food through photosynthesis, or does it need to absorb or ingest food? Be aware that some microorganisms can do both.

- c.** How does it obtain oxygen?

- d.** How does it get rid of wastes?

- e.** What other features or interesting facts did you learn about the organism?

- f.** Use a photo or drawing in a reference book to draw another, more detailed sketch of the organism in the space below.

Part C: Changing Abiotic Factors in Your Miniature Pond Ecosystem

1. Your teacher will assign you one set of environmental conditions described in the Prelab Activity. Place two of your tubes in this new environment.
2. Place the other two tubes where they will receive normal room temperature and classroom light conditions. These tubes will be your experimental controls.
3. Twice a week, for 3 full minutes, observe your organism in its new environmental conditions.
4. Move the tube around to observe as much of the flattened part of the culture tube as possible.
5. Observe how your organism is doing in the tubes under new environmental conditions and in the experimental controls. Be sure to take notice of how the other organisms are faring as well.
6. Keep a “diary,” making entries regularly for two weeks describing how the life of your pond organism has changed due to changes in its ecosystem.

Analysis and Conclusions

1. Compare the overall types and abundance of organisms in the pond water cultures placed in changed environmental conditions to the control tubes.

2. How have the changed environmental conditions affected the well-being of your pond organism? Are there more of the type of organisms you selected, or fewer? How energetic do individuals appear? If all the individuals are dead, continue your observations, describing what is happening in the environment your organism once inhabited.

Name _____ Class _____ Date _____

- 3.** How do the results of your experiment compare with the predictions you made in the Prelab Activity?

- 4.** Did you notice any dramatic change in the organisms' numbers or activity? How could the changes you observe affect the survival of other organisms in the ecosystem?

Extension

Design an experiment to test how organisms in a miniature pond ecosystem respond to cold temperatures, or a change in a different abiotic factor. Show your procedure to your teacher and, with permission, perform the experiment. Compare data from your new experiment to the data you collected previously. What conclusions can you draw from your data?

