

The Nonliving Environment – **Abiotic Factors**

Name:

Per:

Date:

How do organisms react to changes in abiotic factors?

To survive, living things must adapt to nonliving factors in the environment. These nonliving, physical factors, including temperature, climate, air, water, sunlight, and soil, are called abiotic factors. Abiotic factors determine the kind of organisms that are able to live in a certain environment.

Temperature influences organisms because it affects their rate of metabolism—the chemical activities that enable organisms to stay alive, grow, and reproduce. Warm-blooded animals, or endotherms, maintain a constant internal body temperature regardless of external temperature. By contrast, the body temperature of cold-blooded animals, or ectotherms, is determined by the temperature of the environment.

Because fish are ectotherms, they can detect and react to very slight temperature changes. Each species of fish has a temperature range that is optimum, or best, for that species. If the water temperature is too far from optimum for a species, those fish will move to an area with a more favorable temperature. In spring, warmer waters signal fish to migrate to new locations or begin spawning. In the fall, cooler waters signal young fish to move away from their nursery grounds. Since water temperature also influences the behavior of fish, ecologists are concerned about thermal pollution. Thermal pollution is caused when factories and power plants release hot water, used to cool machines in their factories, into surrounding water. Thermal pollution raises water temperatures and affects the behavior and health of fish.

In this Virtual Lab, you will observe how temperature affects a fish's metabolism. One way to determine the metabolic rate of a fish is to observe the rate of water movement over the gills. Rapid movement of the operculum, the bony covering over the gills, indicates increased consumption of oxygen, while slow movement indicates decreased consumption. Counting the number of movements can give observers an indication of a fish's metabolic rate.

Objectives:

- Define abiotic factors.
- List three abiotic factors.
- Describe how an organism responds to changes in an abiotic factor.

Procedure:

1. Click a fish in the holding tank.
2. Set the water temperature in the observation tank to **5 °C** by dragging the temperature slider.
3. Click **Start** to start the Timer. Count the number of times the fish breathes in 15 seconds by observing the gill viewer.
4. Enter the data in the Table.
5. Repeat steps 1-4 with the water temperature set to **10, 15, 20, 25, and 30 °C**.
Notice changes in oxygen levels by observing the **Oxygen Meter**.
6. Now repeat steps 1-5 with the remaining two fish in the holding tank.
7. Complete the journal questions.

Data:

Temperature °C	Goldfish	Sunfish	Catfish
5			
10			
15			
20			
25			
30			