

Lab #1 Observing Homeostasis

(aka: “Freezing” Fish)

Problem:

How does change in the water temperature affect the amount of times a fish beats its gills.
How does a Fish maintain homeostasis when water temperature changes?

Materials:

Beaker
Water
Ice
Fish (medium sized)
Thermometer
Watch/Clock with a second hand



Procedure:

- 1) Fill a beaker halfway with water.
- 2) Using a small dip net, catch a fish without harming it in anyway, and place it in the beaker.
- 3) Allow the goldfish to settle into its new environment in the beaker for several minutes.
- 4) Construct a data table using Microsoft Excel. The left column should be labeled Temperature ($^{\circ}$ C) and the right column should be labeled Breaths per 1 minute.
- 5) Measure the temperature of the water in the beaker. This should be the first number in the Temperature column of your table. Count the number of times the gills move in 1 minute at this temperature. Count twice to make sure you are accurate. Take the average of these two numbers.
- 6) Place ice in the beaker to lower the temperature of the water SLOWLY. You must make measurements every 2° C at least. **(If you want to go every 1° C that will make your measurements and graph even more accurate.)** Every time the temperature of the water drops 2° C, measure the number of times the gills move in 1 minute. It is extremely important to add ice slowly as to not drop the temperature of the water to quickly and miss a measurement.
- 7) Continue this process until you reach 0° C or a temperature at which the gills of the goldfish stop moving, whatever comes first.
- 8) Fill out your table with the temperatures and number of gill movements in 1 minute.
- 9) Once you are finished with your measurements, take any remaining ice from the beaker and allow the water to stand and return to room temperature. ***Do not remove the goldfish from the water till you are told to.*** (You may also wish to cover the beaker to prevent unneeded stress to the goldfish).

Data and Results

Using your data table, construct a line graph of your results

* Make sure your data and results section of your lab write up includes the data table and line graph*

Discussion

- 1) What is the definition of homeostasis?
- 2) What happens to the rate at which gills move when the temperature changes?
- 5) Why does a fish move its gills less in cold water than in warm water?
- 6) What is the overall function of gills in a fish?
- 7) How do gills help fish maintain homeostasis?

Reminders:

** Data Tables and Graphs go in the Data/Results sections of your lab write up. All questions go in the discussion part of your lab.

Teachers Notes:

- ~ Cold water has greater oxygen content. A fish that moves its gill in warm water may be trying to compensate for the lower levels of oxygen in warm water by moving its gills. It may be a sign that the fish is not getting enough oxygen.
- ~ Fish are cold-blooded and their body temperature is dependent on the temperature of the water. When cold, metabolism slows down, lowering oxygen requirements of internal organs and muscles. Warm does the opposite. The variation in the use of the gills maintains homeostasis.

Helpful Websites

- ~ <http://ajpregu.physiology.org/content/285/6/R1269.full> (Advanced)
- ~ <http://dictionary.reference.com/browse/homeostasis> (Basic)
- ~ http://www.ehow.com/facts_7433473_fish-homeostasis-different-water-temperatures.html