

The Effects of Temperature on Swimming Behavior and Respiration Rate of Goldfish

Purpose: To determine the effects of temperature changes on the swimming behavior and breathing rate of goldfish

Hypothesis As the temperature increases, the respiration rate will *increase, decrease, or stay the same.*

Materials:

- goldfish
- fish bowls
- thermometers
- ice cubes
- hot plate
- beakers



Procedure:

1. You will have a goldfish bowl containing 2 goldfish.
2. The goldfish will start at room temperature (About 15~20°C). First, measure and record the temperature and describe the goldfish swimming and breathing behavior.
3. Record the number of breaths the each fish takes per minute at room temperature.
4. Add ice to the fish bowl; wait 2~3 minute and record the temperature. Describe the goldfish swimming and breathing behavior while the temperature is decreasing.
5. When the temperature is in the 10~14°C range, record the temperature and the respiration rate again for each fish.
6. Add more ice; wait 2~3minutes and describe any changes in the goldfish swimming and breathing behavior while the temperature is decreasing.
7. When the temperature reaches 5-9°C, record the temperature and the respiration rate again for each fish.
8. Carefully add hot water to the fish bowl and repeat the above steps, recording changes in swimming and breathing behavior and data for respiration rate in the 22~25°C temperature range
9. Gather data from 4 other groups for a total of 10 fish.
10. Determine the average respiration rate for each temperature range.

Results:

- Record the number of breaths your fish takes per minute for each of the following temperature ranges.
- Record data from 4 other groups near you so that you can compare your fish and get an average. The headings for your data chart should look similar to that below, but with columns for 10 fish!
- Use your data to create a LINE graph, with temperature on the x-axis and breaths per minute on the y-axis.. Use one line to represent YOUR FISH, one line to represent your partner's fish, and another line to represent the AVERAGE for the 10 fish.

Respiration Rate (breaths/minute)					
Temperature (°C)	Fish 1	Fish 2	Fish 3	Fish 4	Average

Discussion:

1. Briefly summarize what you did.
2. Describe how the fish's swimming and breathing behavior and respiration rate is affected by the temperature.
Be detailed and use specific information from the data chart and graph.
3. What other factors (besides temperature) may have affected the breathing rate?
4. How did your fish's respiration rate compare to the average respiration rate. Which reading is probably more accurate? Why?
5. Why do scientists often take lots of data and look at the AVERAGE? Why do you think you did that in this experiment. Refer to the section on sampling error in Chapter 1 of your textbook.
6. Restate your hypothesis. Did your results support or refute your hypothesis? Were you surprised by the results?
7. Propose an explanation for your experimental results: Why do you think fish react this way as their environmental temperature changes.
8. List sources of error in the experimental setup and suggest improvements for these errors.
9. Describe how you would conduct an experiment to test the effects of light on the respiration rate of fish.

Conclusion: One sentence testable statement (10 words maximum).

Reflection: Personal statement about what you may have learned from this experiment.