**Temperature and Respiration Rate**

**Background:**

Water temperatures have an effect on the amount of dissolved oxygen (DO) available to fish. As water warms, it cannot hold as much dissolved oxygen. In contrast, air temperature has little effect on the amount of oxygen in the air we breathe.

A fish must pump water across its gills to meet its oxygen needs. If DO in the water is low, the gills must move faster to get enough oxygen for the fish to survive. We can count these gill movements to measure how much dissolved oxygen a fish needs.

1. What happens to the dissolved oxygen when the temperature in the water goes up? What happens to the amount of times the fishes gills pump?
2. What happens to the amount of oxygen when the temperature in the water goes down? What happens to the amount of times the fishes gills pump?

**Materials:**

250 mL beaker

600 mL beaker

Thermometer

Ice

Goldfish

## **Procedures:**

Each team member will have a specific job as outlined below. Choose your job and write it on the top of your paper.

1. **Gill beat counter**

Count and record the number of gill beats/ minute every time the water changes by 1-2°C..

1. **Time counter**

Tell the gill plate counter when to start and end (one-minute counting intervals).

1. **Temperature guardian**

Announce the temperature changes by approximately 1-2°C. intervals (but no more than 3°c intervals). It is not essential to be exact. Make sure the water changes happen slowly to avoid harming the fish.

4. **Material Monitor:**

Retrieves materials and makes sure that team is being responsible with lab specimen and supplies.

1. Measure 150 ml of water from the fish tank and place in the 250 ml beaker.
2. Use the net and carefully remove a fish place it in the 250ml beaker.
3. Place a layer of ice in the bottom of the 600ml beaker with 100 ml of water.
4. When the water temperature of the large container is well below room temperature 23°C BUT no lower than 15°C, place the small container with the fish into the larger one (see drawing).

Beakers

Thermometer

Water

Fish

Ice

1. **Once the fish has calmed down**, measure the water temperature in the small container and then count the number of gill beats per minute. DO NOT allow the temperature of the small container to drop below 15°C.
2. After the count has been completed at the 15°C reading, change the water temperature (slowly, remember!) by adding warm water into the 600ml beaker.
3. At each 1-2°C. interval, signal the time and gill beat counters to do their counts.
4. Do not allow the temperature of the smaller container to exceed 27°C.

|  |  |  |
| --- | --- | --- |
| **Observation No.** | **Temperature** | **Gill beats/minute** |
| **1** |  |  |
| **2** |  |  |
| **3** |  |  |
| **4** |  |  |
| **5** |  |  |
| **6** |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

 15 16 17 18 19

# gill beats/minute

Temperature (°F

# **Conclusion Questions**

1. The higher the temperature, the less oxygen water can hold. When temperature goes up or down, how does that affect the number of gill beats?
2. What could cause surprising results in the data?
3. What will happen to an animal that does not get oxygen? How does this relate to cell respiration?
4. How does your answer in number three relate to what you saw in the lab?