NAME ____________________________________

MUSSELS: NATURE'S WATER FILTER CREATURES ACTIVITY

In the documentary Watershed Warriors, Gary talks about how mussels are an indicator species that help determine water quality. Mussels are bivalves which are mollusks that have “two valves.”

These valves are how mussels feed and respire. They take water in through their gills to collect food and then push water back out. Mussels are highly sensitive to environmental changes like pollution and habitat destruction. Pollution is a toxin to a mussel’s tissues while habitat destruction, like dams, restricts water currents from flowing at a rate fast enough for their gills to function properly.

If mussels are present in a river, researchers can conclude that the river has good water quality and a biodiverse ecosystem.

Your Group Will Need:

- 1 Clear Plastic Cup or Bottle
- 1 Flexible Tube
- Piece of Sponge (x3)
- Piece of Fabric (x3)
- Piece of Cotton Gauze (x3)
- Small Elastic Bands
- Ruler
- Pipette/Bulb Syringe
- Stopwatch
- Graduated Beaker
- Water
- Food Coloring
- Stir Stick
- Sand

In this experiment, we will model mussel anatomy and measure the impact of gill density on a mussel's filtration.

DIRECTIONS:

Build the Mussel Model

1. Take the cup and place it on a slightly elevated surface, about 4 inches higher than the graduated beaker.

2. Place the small flexible tube so one end is in the cup and the other end is in the graduated beaker.

3. Fill the cup with water, but do not overflow. Add a couple drops of food coloring to the water and stir.

4. Test the mussel model. With the end of the tube that will go into the graduated beaker, use the pipette to push air out of the tube. Make sure the pipette and tube are tight together to ensure a good seal. You should see the colored water rise into the tube as a result of air being removed from the tube.

IMPORTANT: the end of the tube in the cup must be touching the bottom of the cup for every trial.

1. Once the colored water reaches the pipette (some should enter the pipette end), hold the tube down into the graduated beaker and remove the pipette from the tube. The colored water should begin to flow into the beaker and out of the cup above continuously until the water levels are the same or the cup is empty.

Gill Density Experiment

1. Run the siphon model test again. This time one person runs the model while their lab partner works the stopwatch. Time how many seconds the siphon runs before stopping. Record the time and observations on the table. Run this control test three times. Calculate the average time on the table below.
2. Place one of the filtration materials (sponge/fabric/cotton gauze) on the end of the tube in the cup and secure it with a small elastic hair tie.
3. Time the siphon from start to finish for each filtration material. Repeat filtering with each material three times (trials). Use a new sponge/fabric/cotton gauze for each trial.
4. Record the times for each trial for each filtration material on the table.

Control Test:

Trial	Time (Min:Sec)	Observations
1		
2		
3		

Sponge:

Trial	Time (Min:Sec)	Observations
1		
2		
3		

Fabric:

Trial	Time (Min:Sec)	Observations
1		
2		
3		

Cotton Gauze:

Trial	Time (Min:Sec)	Observations
1		
2		
3		

Calculate the average time to siphon in the space below (control, sponge, fabric, and cotton gauze).

Results Analysis

1. Which filtration material allowed water to pass through the fastest?

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2. Which filtration material allowed water to pass through the slowest?

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3. Using the filtration material that filtered the slowest, add sand until it covers the filtration material in the cup.

Time to see how long it takes in seconds to siphon. Write the time below.

Material	Time (min:sec)	Observations
____________ with sand		

Results Analysis - Continued

With your group, put your six filtration tests in order from most clear to least clear, then answer the following questions:

1. Which is the clearest? Which is the least clear? Why?

2. Look at your data table/chart. Which filtered the fastest? Which filtered the slowest? Why?

3. How do your test results compare to your hypotheses?

Discussion Questions

Answer in complete sentences.

1. In this model, what part represents the mussel gills? What represents the mussel’s bivalve system?

2. The sponge, fabric, and cotton gauze change the water resistance on the intake side of the siphon. What does using different filtration materials model?

3. Gravity and water pressure are important parts of how a siphon works. Fill in the blanks on page 8 based on how these forces affect filtration time

Discussion Questions - Continued

a. If the height of the cup is **increased**, the average filtration time is expected to __________. This is because gravity pulls the water __________ from a greater height.

b. If the height of the cup is **decreased**, the average filtration time is expected to __________. This happens because water moves __________ from a lower height.

c. A **wider** tube might make the filtration time __________. This is due to the water pressure being __________ in a wider tube.

d. A **thinner** tube might make the filtration time __________. This is because the water pressure is __________ in a thinner tube.

4. Compare the trial with sand to the average time for that same filtration material without the sand. Did the siphon stop before the water levels were equal or before the cup was empty? How does this trial model sedimentation in a river?

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5. What might happen to the river's water health if mussels disappear from the ecosystem?

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