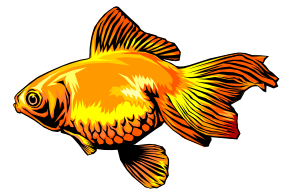


Name: _____ Period: _____



Closed Bottle Ecosystem 2012

Project Objective: To put together a suitable habitat (ecosystem) that will allow one or two guppies to survive to the end of the school year and beyond. You will be making observations of your ecosystem for the next three weeks and recording data to be used in your write up for this lab. The ecosystem in this experiment will be closed, meaning that once you set up your ecosystem, the bottle cap will remain on for the remainder of the experiment. In other words you will not take off the cap to add any food, water, etc.

PART I- Pre Lab Discussion Facts to Consider in Planning Your Ecosystem

1. Fish

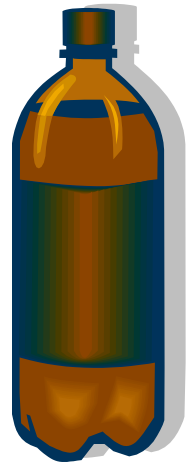
- a. Need H₂O with dissolved O₂ (5-10 ppm)
- b. Need H₂O without chlorine (found in tap water)
- c. Need H₂O with living bacteria (decomposers) to break down wastes such as ammonia into nutrients so that they can be recycled and be used by the plants.
- d. For every inch of fish you need about 2-4 liters of water. If fish are too crowded they may feel stressed, use the O₂ up too fast, or may produce more waste than the bacteria can take care of.
- e. Guppies are herbivores (primary consumers). They can eat plants and algae that grow on the sides of aquariums.
- f. Guppies should do fine at room temperature the next few months. However, if the H₂O gets too hot, the dissolved O₂ will decrease and the guppies may suffocate.
- g. Adult male guppies are much more colorful than female guppies. It is difficult to determine the sex of baby guppies.
- h. Guppies reproduce sexually and give birth to live young in a well-maintained aquarium.

Where does the O₂ that the fish needs come from? _____

Do you think you should leave an air space at the top of you bottle or fill it with water to the top? _____

2. Plants

- a. Need a source of CO₂, H₂O and sunlight to carry out photosynthesis.
- b. Water plants can grow free-floating in water. However if you provide a substrate (pebbles, rocks, sand or soil) they will root and become more productive plants. Algae (protists that carry out photosynthesis) also benefit by having something to grow on.
- c. We will use a number of different types of water plants. One of the common water plants we will use is called anacharis and elodea.



Where does the CO₂ that the plant needs to do photosynthesis come from? _____

(Don't forget that all organisms that carry out cellular metabolism produce CO₂ as a waste product!)

3. Bacteria

- a. Bacteria are decomposers and will break down the wastes and return nutrients to your ecosystem so that it can be used again.
- b. In this closed ecosystem you will not be able to use filters and pumps used in aquariums to keep the water clean. Bacteria and other decomposers have a special importance in your closed bottle ecosystem.

4. Abiotic Factors in your ecosystem

- a. Substrate- sides of your 2 liter bottle, pebbles, rocks, gravel etc.
- b. Sunlight is a critical factor for the plants and algae. Where should you locate your ecosystem so that it gets enough sunlight for the plants but not too much that it makes the water too warm for the fish to survive? _____

- c. Do all of the windows in the classroom receive the same amount of sunlight each day? _____

(Hint: sunrises in the East and sets in the West)

- d. What is the definition of an abiotic factor? An Abiotic Factor is _____

PART II

Resources You Can Use in Building Your Ecosystem

Check off the items you want to use and have your teacher review before you go to PART III.

- | | |
|---|--|
| <input type="checkbox"/> Tap Water (has chlorine) | <input type="checkbox"/> Snails |
| <input type="checkbox"/> Ms. Eisenburg's Pond Water | <input type="checkbox"/> Fish |
| <input type="checkbox"/> Mr. Rouse's Pond Water (algae) | <input type="checkbox"/> Gravel |
| <input type="checkbox"/> Algae | <input type="checkbox"/> pH paper |
| <input type="checkbox"/> Elodea | <input type="checkbox"/> Fertilizer Granules |
| <input type="checkbox"/> Duck Weed | <input type="checkbox"/> Sunlight |
| <input type="checkbox"/> Water with Decomposers | <input type="checkbox"/> Salt |

PART III
Putting Your Ecosystem Together and Collecting Data

Date you added the fish to your ecosystem: _____ 2012. This will be day 1 of your experiment.
Take a few measurements at the beginning so that you will be able to determine if organisms are growing.

Estimated length of your fish in millimeters: _____
Length of your water plants in millimeters: _____

DATE	DAY	Observations
/ /12		

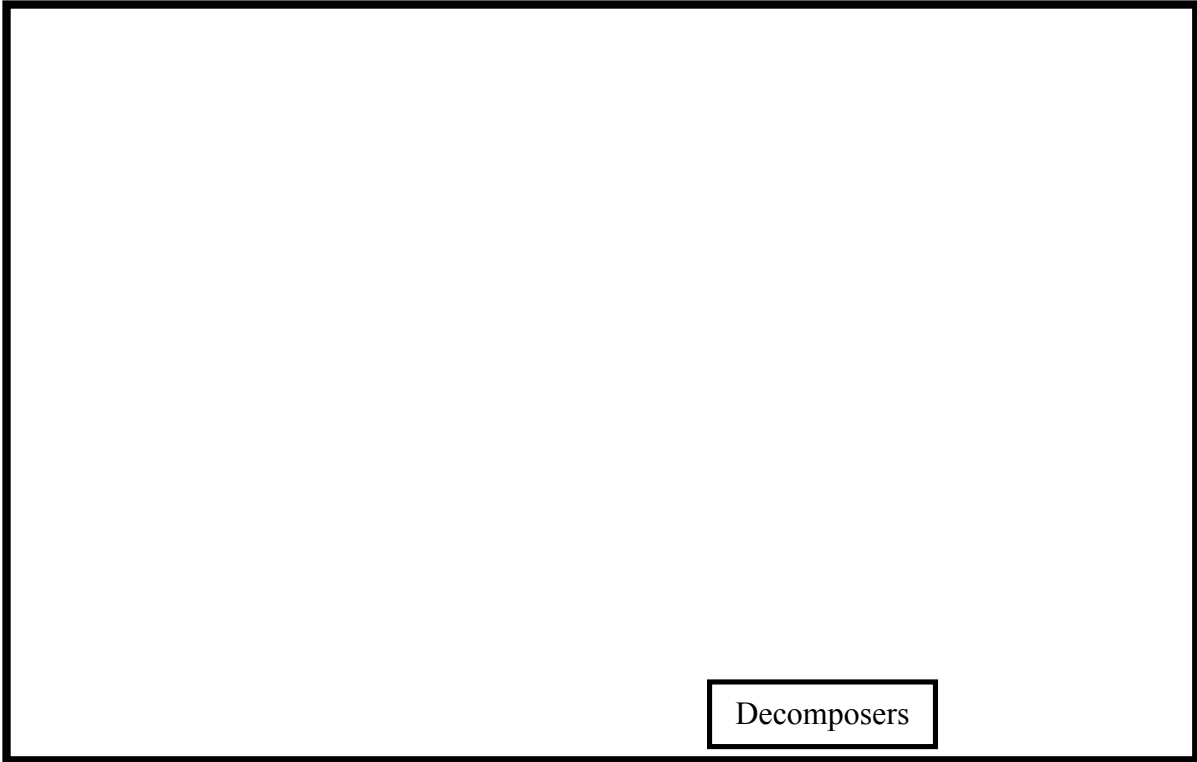
PART III- Post Lab Discussion

1. Did your fish survive? How long? Explain. _____

2. What do you think the limiting factors may have been for students who had the fish die in their closed bottle ecosystem? _____

3. What organisms make of the **community** of your closed bottle ecosystems? _____

4. Draw a **food chain** that exists in your closed bottle ecosystem:



5. What did this lab teach you about recycling (such as CO₂, O₂) in an ecosystem? Explain in a few sentences _____

