Name_____ Date_____

ECO-COLUMNS

PURPOSE:

The purpose of this lab is to create simulated ecosystems in an effort to learn about ecosystems in the real world.

PROCEDURAL OVERVIEW:

Part 1: Plan your eco-column

1. First familiarize yourself with the project and eco-columns. Look over the assembly diagram to understand each chamber.
2. Identify a ***specific*** ecological question that you would like to investigate through the creation and observation of your eco-column. ***This can be revised as you build your column.***
3. Write a claim (hypothesis) that relates to your experimental question. (Turn the question into a claim-statement that can be measured). You can revise the claim as you continue your research/building.
4. Decide what components to include in each section (which organisms, type of soil, etc.). See the lists on page 3 for ideas. Think about ***all*** the requirements of the various organisms to survive (biotic and abiotic). If you don't provide these requirements, your organisms will quickly die. Make sure that you can feasibly acquire all the organisms you choose.

Part 2: Background Research

Conduct background research to acquire additional information. This summary must include information on the following topics:

- General eco-column information
- Information related to Biodome and Biosphere projects that have occurred around the world
- Information relating to the problem you are investigating with your eco-column

Each student needs at least 3 credible sources of information. All sources may be websites.

Name_____ Date_____

Part 3: Construction

There will be two phases of eco-column construction. The first phase will be the assembly of the eco-column and second phase will be the addition of all abiotic components and plants (terrestrial and aquatic). Other organisms will be added one week after the initial construction once the ecosystem has stabilized.

Part 4: Observation and Data Collection

You will conduct ***weekly*** observations of your eco-column. Each observation will include:

- The date of your measurement
- The number of days your eco-column has been running
- Aquatic habitat observations: plant growth, fish status, decomposition rate, odor
- Decomposition rate within compost habitat, animal status
- Plant growth and animal status in the terrestrial layer.

You will add bottled water at the top of your eco-column during each weekly observation. Any other additions/alterations should be kept to a minimum.

Part 5: Presentation of Experiment

You will make a slides presentation and answer your science question and claim, including pictures and data measurements from the bottles over time.

Name_____ Date_____

IDEAS FOR CHAMBER COMPONENTS:

AQUATIC HABITAT

- Fine grained aquarium gravel (provides “bedrock”)
- Sand or topsoil (provides bottom sediment)
- Untreated tap water or distilled water (provides aquatic habitat)
- “Boulders,” “sunken logs,” and other miniature objects typical of a pond bottom
- Aquatic plants and animals

COMPOST HABITAT

- Fine grained aquarium gravel (provides “bedrock”)
- Sand/topsoil mix (provides soil substrate)
- Leaf litter (provides compost habitat)
- A few (finely cut up) chunks of turnips, potato, apple, or other roots, stems, or fruits
- Twigs
- Earthworms, pill bugs, millipedes, and other natural inhabitants of leaf litter

TERRESTRIAL HABITAT

- Fine-grained aquarium gravel (provides “bedrock”)
- Topsoil (provides soil substrate)
- Leaf litter (provides decaying material)
- “Boulders,” “dead trees,” and other miniature objects typical of a forest habitat
- Terrestrial plants and animals
- Food for animals as needed

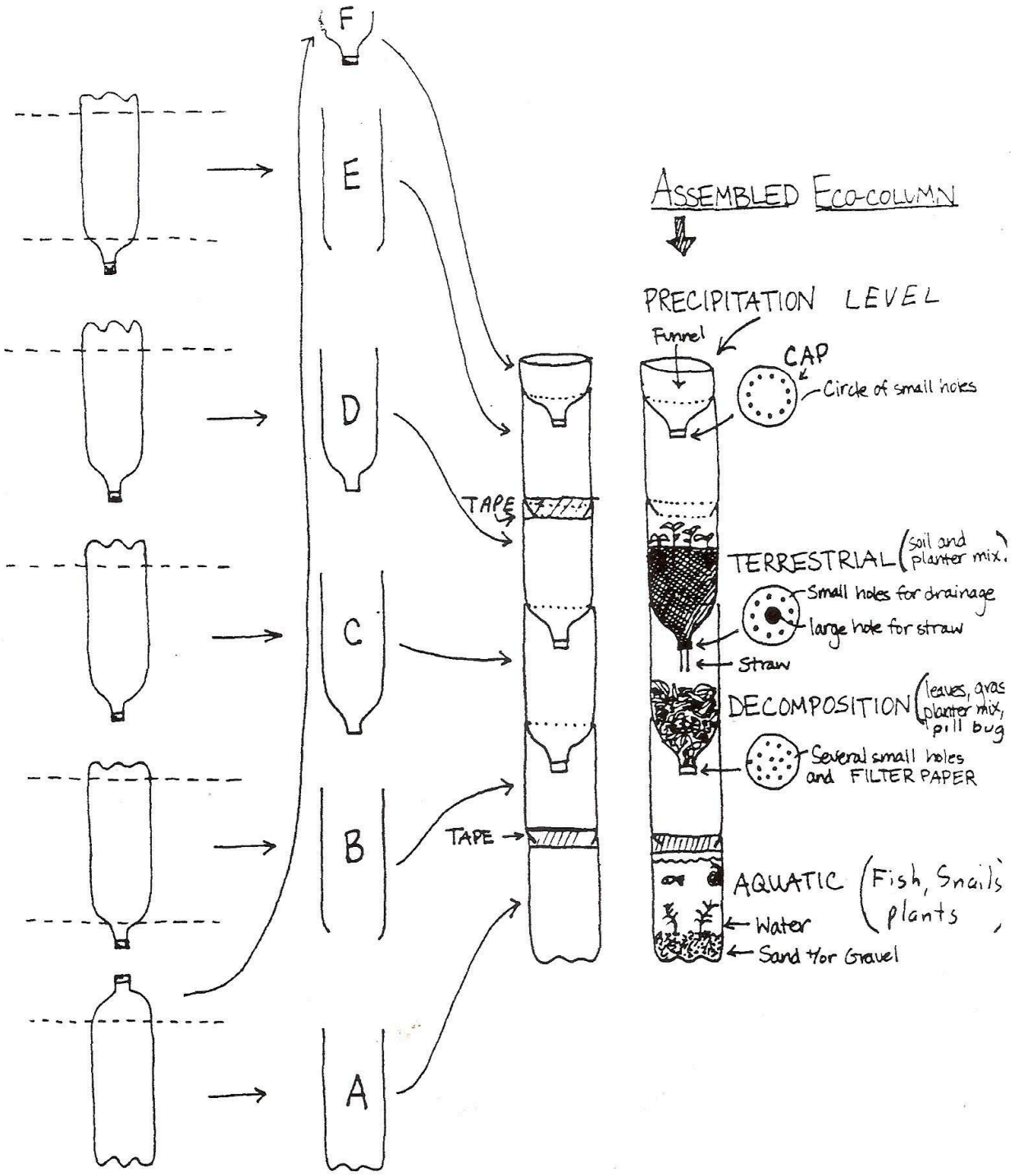
Name_____ Date_____

Abiotic Materials	Biotic Organisms
• Three to five 2-liter bottles • Bottled water • Soil, sand and gravel • Dirt/potting soil • Construction materials and tools • Miniature objects for pond bottom and terrestrial layer • Wick or loose string to connect layers	• Compost/food materials (no citrus) • Terrestrial organisms you would like to include (earthworm, plant, spider) • Organisms for decomposition chamber (pill bugs, etc) • Aquatic organisms such as water snails, a guppy (no goldfish), pond water plants

NOTES: Goldfish are not a good choice. They tend to poison themselves with their own waste. Additionally, you do not want to include too many organisms in your eco-column. They will have difficulty surviving.

Name_____ Date_____

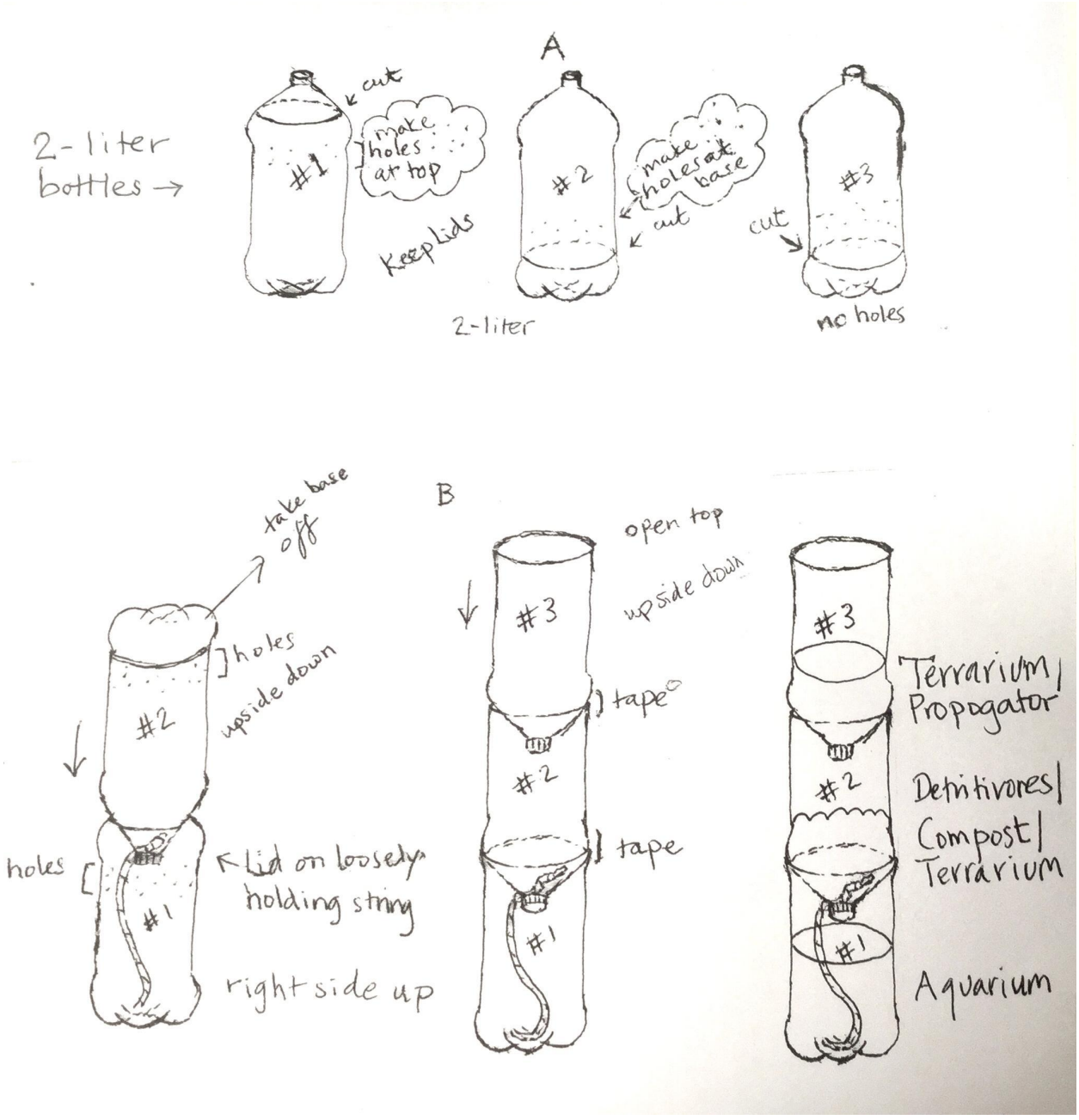
FIVE-BOTTLE SYSTEM



Name_____ Date_____

THREE-BOTTLE SYSTEM

MAKE HOLES IN BOTTLE CAPS



Name_____ Date_____

BUILDING INSTRUCTIONS (CHOOSE EITHER 3- OR 5-BOTTLES)

5-bottle instructions

0. Follow the instructions for making cuts in Column Assembly
1. Melt or drill a hole in three of the bottle caps and screw onto the cap for F, D, C. Note cap for D also has large hole in center.
2. Insert the straw through the hole in the bottle cap of what will be the Terrestrial habitat (bottle D). Straw should extend below cap and above soil.
3. Invert Bottle D (terrestrial habitat) over Bottle C and invert both over Bottle B (aquatic habitat).

STOCKING INSTRUCTIONS (3- AND 5- BOTTLE OPTIONS)

Aquatic habitat (Bottom)

4. Add a layer of sand or topsoil (about 1 inch) to the deep base.
5. Add a layer of gravel (about 1 inch) on top of the sand or topsoil.
6. Add water to a level about 1 inch below the top of the cut.
7. Plant aquatic plants with roots in the bottom sediment/add floating aquatics. No plastic plants. A chopstick will help you push in any roots.
8. Arrange “boulders” and other objects on the bottom sediment.
9. *Let the aquarium sit until the sediment settles.*
10. Aquatic snail/fish may be added after one week once the environment has stabilized.

Compost habitat (Middle)

11. Mix equal parts of sand and topsoil together and add leaf litter.

12. Mix food items in.
13. Add compost animals as needed (you may collect some with the leaf litter).

Terrestrial habitat (Top)

14. Add a layer (¾ inch) of gravel to top
15. Mix soil and potting soil together, moisten, and add a layer (3-4 inches) over the gravel.
16. Add terrestrial animals that burrow to the soil (e.g., 1 worm).
17. Plant terrestrial plants in the soil.
18. Arrange “dead trees” and other objects on soil.
19. Terrestrial animals will be added after one week once the environment has stabilized.

Maintenance Instructions

20. Eco-columns can be placed under the grow lights. Or placed by a window with no direct sunlight. For safety, tape the bottles to the window to avoid spillage.
21. Add a small amount of water to the terrestrial habitat weekly ***or*** when it appears to be drying out. A fine spray of water on the plants also maintains the unit well.

Name_____ Date_____

Eco-Column Presentation Instructions

Describe your eco-column adventure and research from beginning to end.
Include at least 10 slides and pictures from throughout the eco-column project
The presentation must include:

a. Scientific question and claim
b. Design & construction
c. Changes in eco-column over time including data measured or observations made
d. Include the following diagrams 1 and 2 (draw on paper, take a picture and upload, or draw using online tools)
e. The final eco-column: what happened? Did anything die? Did the ecosystem stay alive? Did you answer the question?
f. Did your evidence collected support or reject the claim?
g. What you learned/discovered through project

1. **A diagram of your eco-column that identifies the biotic and abiotic factors present in each habitat.** Your eco-column has a unique structure. Draw a diagram that shows your column and what is in each section. You can list the biotic and abiotic factors along the side or in separate paragraphs.
2. **Diagram of the food webs within your eco-column.** Make every effort to identify the species you have added as specifically as possible. If an organism is unidentifiable, still include a drawing of it.
   - Draw each organism in a circle. Give the name if at all possible. Scientific names are best—plus common name. ***You must provide the scientific name of at least 3 of your organisms.***
   - Identify the role of each organism by putting one of the following letters just beneath the name of the organism:

     P - producer

     C - consumer

     D - decomposer

     S - scavenger

- Draw the energy arrows. These lines should go from the energy source towards the organism that gets that energy.