Can plants grow without soil?

Name: _____ Date: _____

Instructions:

1. Gather your materials to build your experiment:
    a. Basil plant clippings (2 per group), Recycled 2L bottles (2 per group), Small glass cups (2 of the same size per group), Scissors or knife (teacher supervision required to cut hole in bottle), Ruler, Permanent marker, Mesh material (for shade cloth; can use cheesecloth), Nutrients (e.g. plant food such as miracle-gro from hardware store is fine), Metal or silicone straw

2. Use a ruler and scissors to cut your basil clippings so they are the same size. Measure from the base to the tip of the stem, without including leaves.

3. Write down the length of your basil clippings on your data sheet.

4. Add about an inch of water to the bottom of both glasses. Be sure both cups have an equal amount of water.

5. Draw a line on the glass to mark the water level. As water evaporates over time, refill water up to the line.

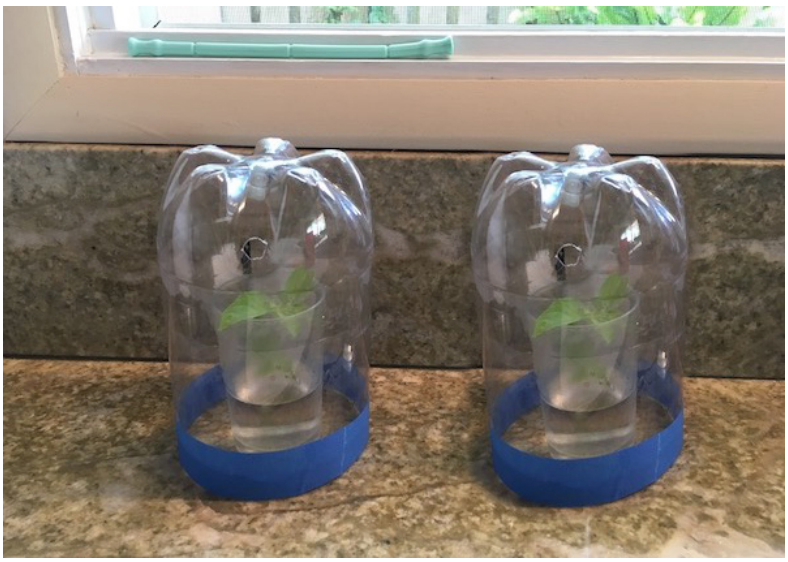
6. Place one basil clipping in each glass so the base of the stem is submerged (Fig. 4).

7. Cut the top off of your recycled 2L bottles to create the ‘grow domes‘ for your plants

8. With help from your teacher, cut a small hole in the side of each grow dome. Clean the domes.

9. Place a 'grow dome' upside down on top of each of your two basil plants

Example grow domes:



Test your Variables

10. Label each glass and corresponding grow-dome A or B.
    a. You will apply manipulations to the plant labeled A.
    b. Leave plant B alone to grow as your contol.
    c. Don't mix them up!
11. Allow both plants to grow under the 'grow domes.'
    a. Keep the water levels at the line drawn on each glass.
    b. Measure plant A and B periodically and write the heights on your data sheet.
12. Conduct trials to manipulate the three variables of carbon dioxide (CO2), nutrients, and light:

Trial #1: Extra CO2

a. Using the metal or silicone straw, blow into plant A to add CO2.
b. Set up a schedule so you can add CO2 as often as possible at regular and consistent intervals.

Trial #2: Extra Nutrients

a. Follow the instructions on your plant food mixture to add nutrients to plant A at regular intervals. Once a week should be fine, but you can also experiment with different intervals.
Note: Keep in mind, your plants are not in very much water, so be sure you don't add too much of the nutrient mix!

Trial #3: Limit Light

a. Place the mesh cloth over plant A to limit the amount of light available. Tape it down so it stays in the same position for the whole experimental period.
Note: You may need to double up the mesh cloth or use a different material to limit the light more fully.
b. Let both plants grow for the designated time, ensuring they both have enough water.

Name: _____

Instructions: Measure your plant at regular time points with a consistent method. Make observations about the height, leaf count, and root structure.

Variable You Tested: _____

Date	Plant A Height	Plant B Height	Observations

Activity Questions

1. What variable did you test in your experiment?

2. Which of your plants (A or B) grew more? By how much?

3. What else did you notice about the structure of your plant? Describe the growth of both plants. (Hint: look at other structures like the roots or leaves)

4. If another group looked at the same variable, how do your results compare to theirs?

5. Compare the results across the three variable trials: CO2, nutrients, and light. (Hint: did you observe differences in plant health, root structure, stem growth, quantity and/or color of leaves, etc.?)

6. What variables contribute to plant growth? Use data from your class' experiments to support your statement.

7. Why is it important to control as many variables as possible in an experiment? (Hint: why did each trial look at only one variable? Why did each trial have a control (plant B)?)

8. What are the minimum requirements that plants need to grow?