

Build a hydroponic system!

Name: _____ Date: _____

Instructions:

1. Gather your materials to build your experiment:
 - a. Container to hold water, Thick piece of square foam (e.g. Styrofoam), Plant food (e.g. MiracleGro™), Root structural support (e.g. cinder, gravel, pumice or grow stones), Aquarium aerator with tubing and airstone, Small plastic pots, Basil (1 or 2 plants with roots per group plus an extra plant that will stay in the soil), Ruler, Access to water to keep your system filled, Counter or table space with sunlight for growing the hydroponic plants, Optional: black spray paint and painters' tape, pH test kit (1 per class, available at pet stores).

2. Start with enough basil plants (ones that have roots and are already growing) for groups to create different grow condition treatments (1 or 2 plants per group)

3. Keep 1 or 2 plants in soil and place them next to, or near, your hydroponic systems (so they can grow in similar light conditions). This will be your 'control plant' and will provide a comparison to the hydroponic plants at the end of the growth period. Don't forget to water both the control and the treatment plants over the experimental period!



Prepare your water container and mixture!

4. Optional: if it is not already black, you can paint the outside of your water basin to help prevent algae growth. Using painters' tape, block off the top inch of the container and paint the bottom (so the top remains clear and you can observe the water level)

Note: You can leave the container clear! Doing so will allow you to see root growth, however a clear container may require extra cleaning to remove algae growth.

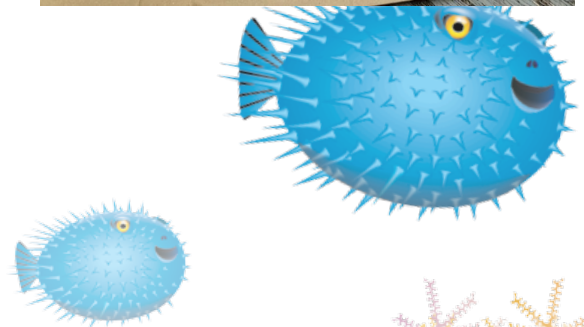
5. After the paint is dry, fill the container with water just above the black line, leaving space for displacement when you add the plants. Be sure to place your system near an outlet if you are using an aerator and air stones.



6. Stir in a teaspoon of plant food and allow it to dissolve.

Note: The amount of nutrients added might need to be adjusted based on the size of the water basin. Follow instructions on plant food packaging for assistance.

7. Plug in the aerator and place the stones in the water mixture.



Prep your plants

8. If you are using small plastic pots that don't have holes, drill holes to allow for water transfer.

9. Trace the bottom of the hydroponic pots on the foam.

Note: Don't space the holes too far apart or the edges of the foam will sag and your pots will not float evenly!

10. Cut out the circles in the foam. You will need to cut a little wider than the traced circle to allow the pots to sit low enough in the water.

11. Fill the bottom of the hydroponic pots with about an inch of root structural support, such as black cinder.

12. Remove the basil plants from their starting pots, gently removing soil from around the root structures.

13. Place the plants in the hydroponic pots so the bottom of the roots touch the bottom of the pots, and fill in the remaining space with more cinder so the plants can sit upright.

14. Put your hydroponic pots into the holes of the foam. Allow about an inch or two of the pots to be exposed below the foam—this lower two inches of the pot will be submerged in the water.

15. Place your hydroponic pot and foam combination in your water container and allow them to grow!



Care for your system

16. Water will evaporate over time, so you will need to refill your container. Every time (or every other time!) that you refill, add more nutrients to keep the plants growing well.

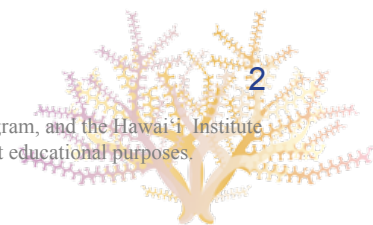
17. Optional: Use your pH test kit to check the pH regularly. This will help ensure your system is stable. Basil likes a pH of about 6.5-6.8, so you can adjust as needed using your pH up or down bottles in the test kit.

18. Let the plants grow!

19. Measure your plants' growth, and record your results in the data table on your worksheet. Use a consistent method to measure, for example:

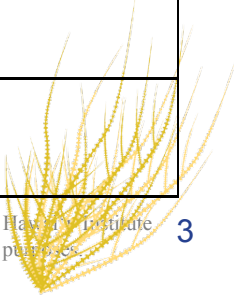
- Place the bottom of the ruler at the base of the plant and measure to the tip of the main stem.
- Count the number of leaves, or choose a leaf to measure each time.

20. Compare these results to the plant grown in soil only.

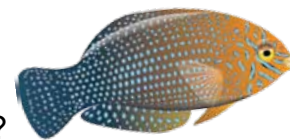


Type of Plant: _____

Date	Soil Plant Height	Hydroponic Plant Height	Notes and Observations



Activity Questions



1. What happened to your best growing plant during the experiment?
2. Where did your plant get its energy to grow?
3. What resources did you give your plants?
4. Compare the basil grown in soil versus the one grown hydroponically:
 - a. Describe how your hydroponic plant grew.
 - b. Describe how your plant in soil grew.
5. Collect the class data for plant growth:
 - a. What was the class average hydroponic plant growth height (inches)?
 - b. What was the class average soil plant growth (inches)?
6. How does your data compare to the class average?
7. Did the plants need soil to grow? What evidence do you have?
8. Why do you think plants normally grow in soil?
9. What do you think soil provides to plants?
10. How are hydroponic plants surviving without soil?
11. Aquaponics is a system that combines aquaculture (the growing of aquatic animals, like fish, snails, clams, etc.) in combination with hydroponically grown plants. In aquaponic systems, growers do not need to add nutrients (like you did in this hydroponic experiment). Explain why aquaponics systems do not need added nutrients.

