

Name _____

Period _____

Science Technology Engineering and Mathematics
ENGINEERING DESIGN AND INQUIRY

HYDROPONICS SYSTEM CREATION AND
EVALUATION PORTFOLIO



Defining the Problem and Brainstorming

- 1. According to the *Request for Proposal* (RFP), what is the problem?**
- 2. What is hydroponics?**
- 3. What are the benefits of using hydroponics versus planting in soil?**
- 4. What questions do you have about the RFP requirements of the challenge?**
- 5. What do you need to learn more about?**
- 6. How can you learn what you need to know?**

Researching and Generating Ideas

Research on Hydroponics Design	
1. Types of Hydroponics System Designs?	2. Types of Materials used for Hydroponics Systems?
3. Benefits of Hydroponics	4. Estimated Cost of Materials?

Research on Plant Growth

5. What nutrients do plants need for growth? What does each nutrient do for the plant?

6. How does a plant make its own food?

7. Properties of water and the role it plays in the plant's production of food?

8. How do plants get the nutrients and water they need?

Identifying Criteria and Constraints

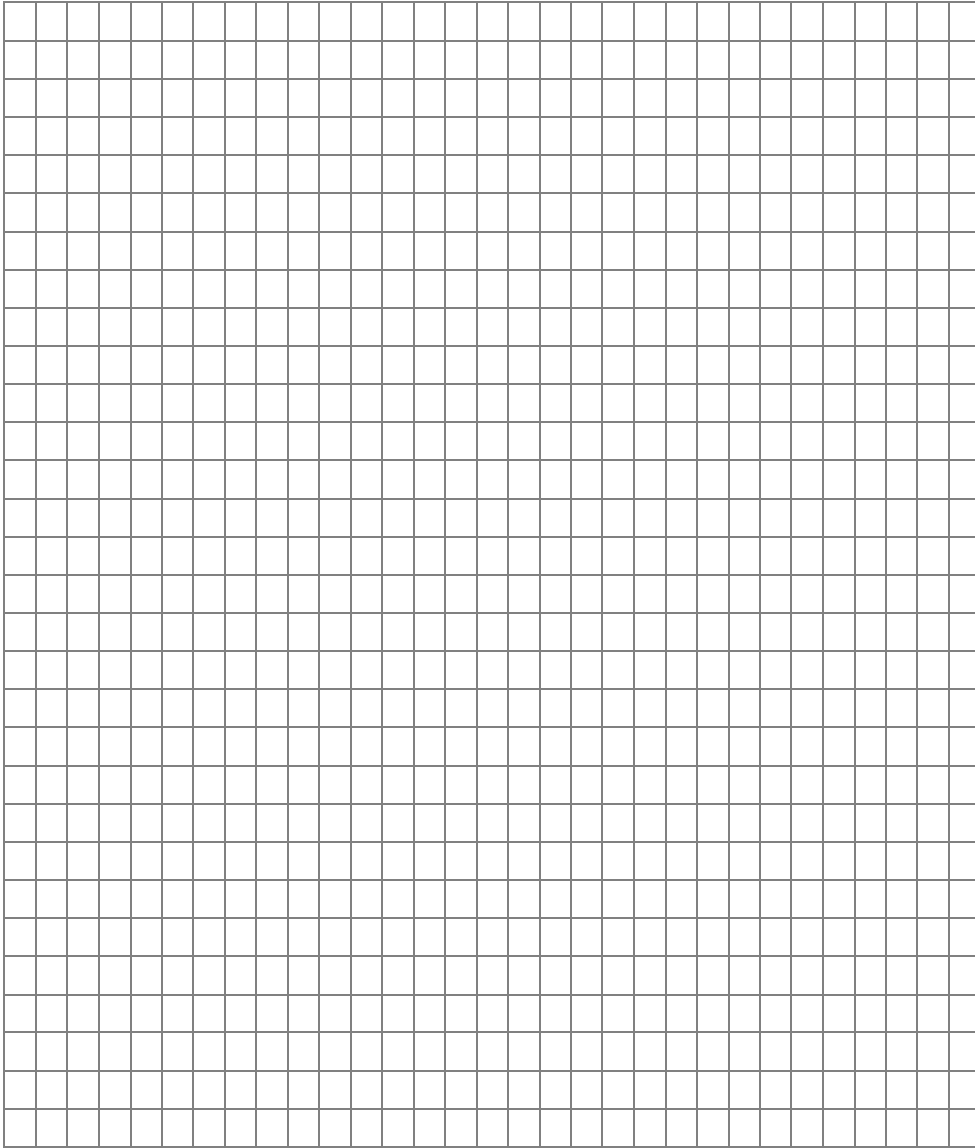
1. What are the design constraints that may affect your project?

2. What are the variables that may affect your project? Complete the table below

Independent Variable (what you are testing)	Dependent Variable (what you are measuring)	Controlled Variables (all things that must stay the same to be able to draw a conclusion)

Exploring Possibilities

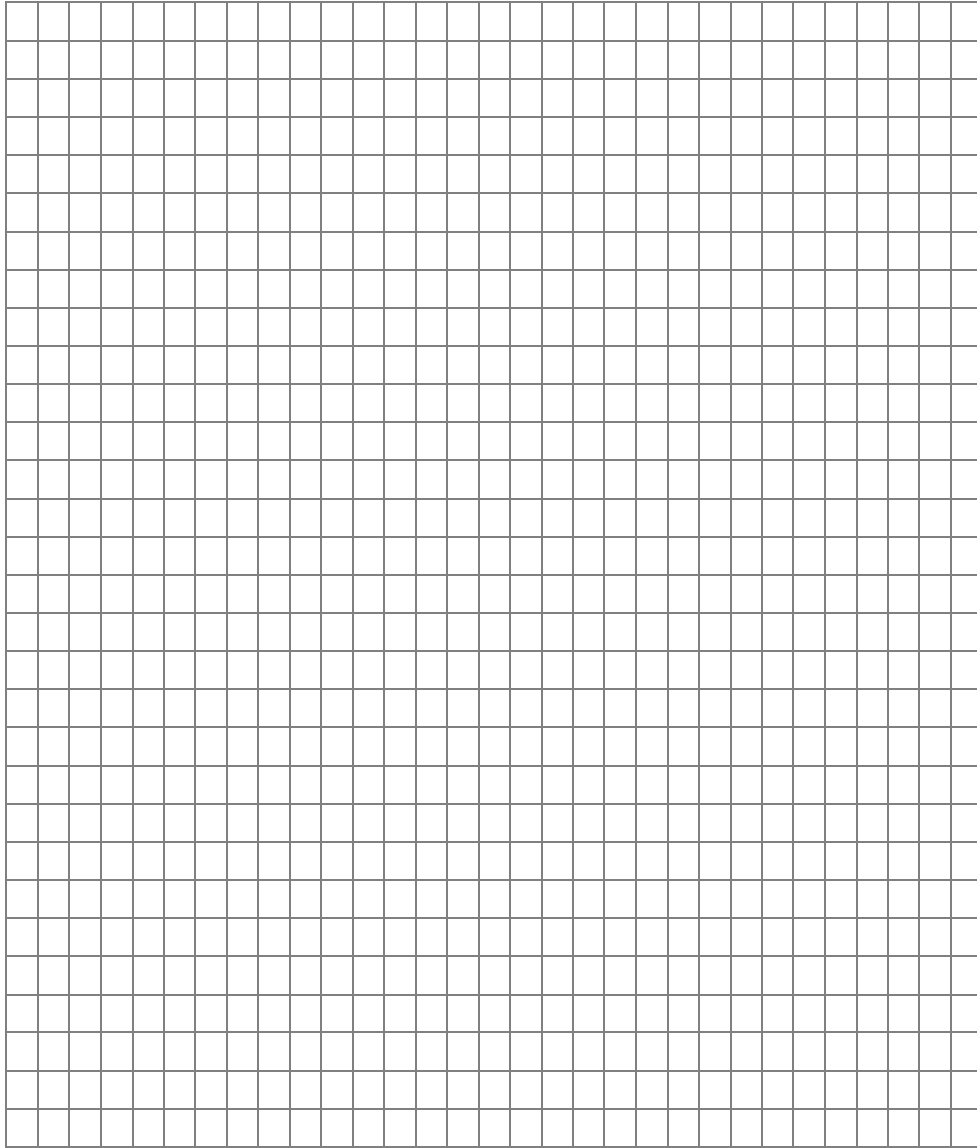
Design Proposal #1



- 1. Explain how the design above solves the problem and meets the design constraints?**
Hint: Use data from investigations and research. Which variable(s) are you focusing on to measure your success?
- 2. What materials, tools, etc. will you need to construct your design?**

Exploring Possibilities

Design Proposal #2

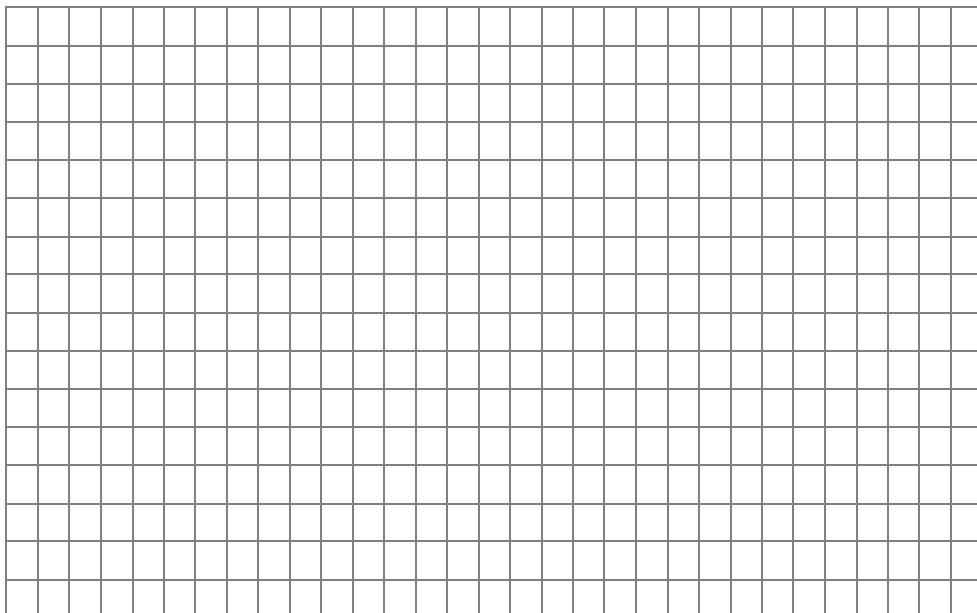


- 1. Explain how the design above solves the problem and meets the design constraints?**
Hint: Use data from investigations and research. Which variable(s) are you focusing on to measure your success?
- 2. What materials, tools, etc. will you need to construct your design?**

Selecting an Approach

Type of Hydroponics System	Pros	Cons

Sketch your final design, to scale, in the space below. Show the view that includes the most relevant aspects of your design.

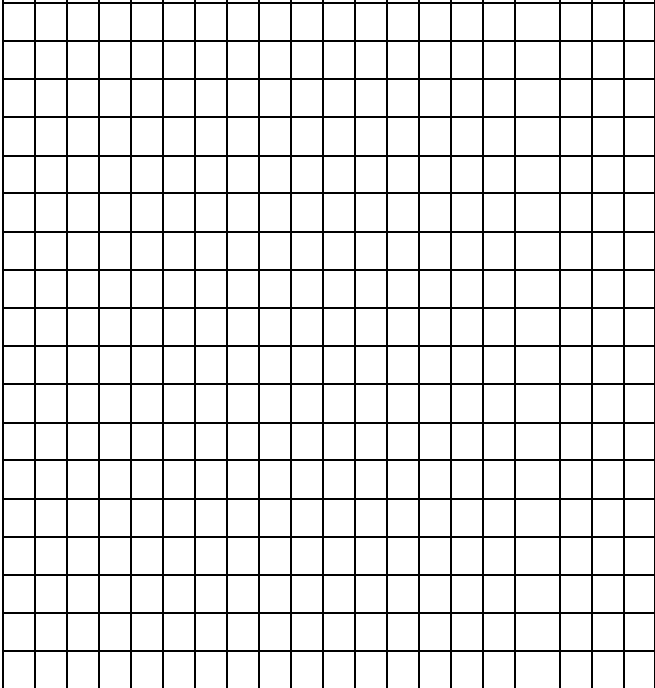
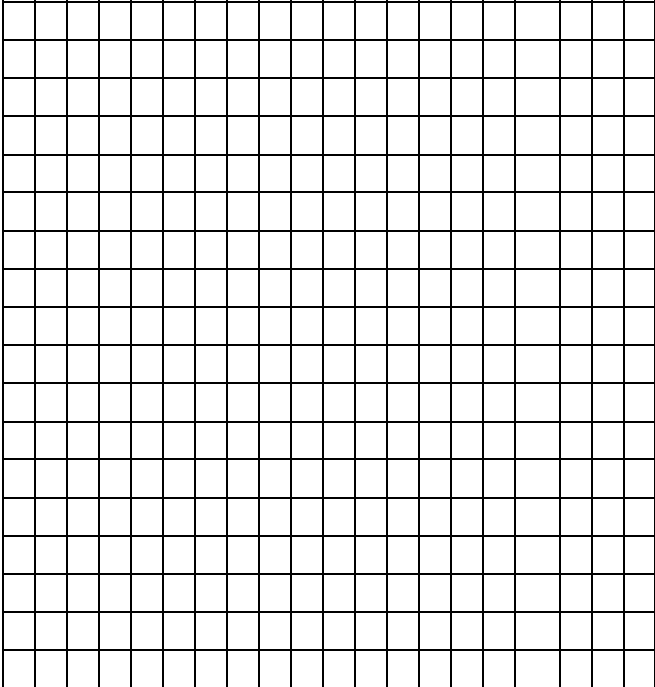
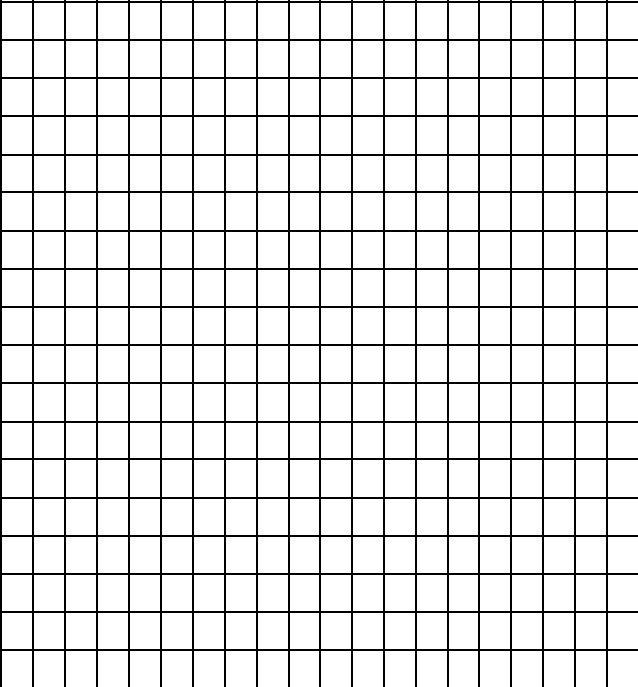


Scale: 1 block = _____

In the space below, explain why you choose this design. In your response, be sure to justify the choices you have made. (for example: the type of medium, nutrient solution, plant variety, etc...)

A large rectangular box with a black border, containing 15 horizontal lines for writing.

Making a Model or Prototype

<p style="text-align: center;">TOP</p> 	<p>Procedure for creating prototype:</p> <p>Scale:</p>
<p style="text-align: center;">FRONT</p> 	<p style="text-align: center;">SIDE</p> 

Testing and Evaluating

Directions: Use the space below, another paper, online resources, etc...to create and maintain a data table on plant growth in your hydroponic system.

For example:

Days Since Planting	Height	# of Leaves	Other Observations/Notes
1	.5 cm	0	Roots sprouting from seed.
5	2 cm	2	Two small sections of leaves. Bright Green color. Added more water to replace evaporated water.
10	5 cm	8	Roots have started emerging from bottom of medium. 2 Large leaves with 6 smaller. Added more water and nutrient solution to system.
20	10 cm	16	Added more water and nutrient solution to system.
30	20 cm	>30	Needed to transplant to a larger system. Carefully removed medium from roots and transferred to larger container. Added more water and nutrient solution to system.
45	30 cm	>40	Small white flowers appearing at top of stems. Added more water and nutrient solution to system.

Communicating Process and Results

1. How will you share your design, and reasons and processes for making your design decisions? *Hint: Write a script*

2. How will you use data to determine if your project design was successful?

3. Based on your results and the feedback from others:

a. What were the best things about your design?

b. What were the weaknesses of your design?

c. How could you improve your design? Why do you think your re-design would yield different results?

Communicating Process and Results

Directions: Your teacher will determine the specific processes for giving and receiving feedback on your proposals. Please use the information below to help give and receive feedback.

Criteria for Feedback:

As you give feedback on other proposals. Consider the following:

Are your comments:

- *respectful*: comments should not be mean-spirited, insulting or condescending
- *warranted*: comments – whether positive or negative- should not be trivial, exaggerated or unfounded,
- *specific*: comments should identify particular aspects, as opposed to very vague remarks (using an example, illustrate the value of the specific item rather than vague general comments),
- *constructive*: the primary purpose of critique is to improve our work – not to belittle or criticize; therefore, advice on how to improve is preferable to comments that merely note areas of strength or weakness.

Advice for hearing critiques of your work

Assume an active listening role by limiting your comments to:

- asking for clarification or elaboration,
- checking for understanding and,
- Determining whether or not the ideas held by the commentator are widely held.