**Student Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Graphic Organizers for Hydroponics Engineering Challenge**

**Engineering Problem:** A family wants to be able to grow their own lettuce at home. Design a hydroponics system that uses solar energy from the light of an average size window (approximately 76 cm x 120 cm). Your hydroponics system should be able to grow two lettuce plants from seedlings. You will supply water to the plants from a wicking system (a self-watering system in which an absorbent material carries water to the plant). Your hydroponics system should be able to…

* Be positioned so that it receives the light from the window.
* Be stable without falling down.
* Not leak.
* Be able to fit and grow two plants of lettuce

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| **Questions you have about the problem** |
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| **What information would you need to research before designing your hydroponics system?** |
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| **Information Obtained from Research to Inform Our Designs** |
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| **List the limitations/constraints you have to think about when designing a window hydroponics system** | **List the criteria for success of how you will know your hydroponics system is successful** |
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| **Data from Testing Different Wicking Materials** | | | | |
| **Material strips tested**  **(3 cm x 15 cm strips)** | **Weight of dry strip in a cup** | **Weight of wet strip in a cup** | **Amount of water absorbed by the strip** | **Ranking of speed of absorption**  **1 (fastest) to**  **4 (slowest)** |
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| **Conclusion Drawn from Wicking Investigations—Provide Evidence and Reasoning** |
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| **Drawing of Design Idea #1** |
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| **Drawing of Design Idea #2** |
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| **Drawing of Design Idea #3** |
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| **Evaluation of Design Ideas** | | | |
| Criteria | Design #1 | Design #2 | Design #3 |
| Criteria #1 |  |  |  |
| Criteria #2 |  |  |  |
| Criteria #3 |  |  |  |
| Criteria #4 |  |  |  |
| Criteria #5 |  |  |  |

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| **Drawing of the 1st Design to Test** |
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| **Explain the reasons for the design features you chose for the 1st prototype your team will test** |
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| **Observation Data from 1st Design** | | | | | |
| **Date** | **Observations and Measurements of Plants** | | **pH Level** | **EC Level** | **Any Notes about Features of System** |
|  | **Plant #1** | **Plant #2** |  |  |  |
|  | **Plant #1** | **Plant #2** |  |  |  |
|  | **Plant #1** | **Plant #2** |  |  |  |
|  | **Plant #1** | **Plant #2** |  |  |  |
|  | **Plant #1** | **Plant #2** |  |  |  |
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|  | **Plant #1** | **Plant #2** |  |  |  |

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| **Evaluation of the 1st Hydroponics Design Prototype** | |
| **Features of the 1st Design that Work Well** | **Features of the 1st Design that Need Improvement** |
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| **Drawing of the Improved Design** |
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| **What did you change in your design and why? We changed\_\_\_\_ because\_\_\_\_\_.** |
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| **Observation Data from 2nd Design** | | | | | |
| **Date** | **Observations and Measurements of Plants** | | **pH Level** | **EC Level** | **Any Notes about Features of System** |
|  | **Plant #1** | **Plant #2** |  |  |  |
|  | **Plant #1** | **Plant #2** |  |  |  |
|  | **Plant #1** | **Plant #2** |  |  |  |
|  | **Plant #1** | **Plant #2** |  |  |  |
|  | **Plant #1** | **Plant #2** |  |  |  |
|  | **Plant #1** | **Plant #2** |  |  |  |
|  | **Plant #1** | **Plant #2** |  |  |  |

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| **Evaluation of the 2nd Hydroponics Design Prototype** | |
| **Features of the 2nd Design that Worked Well** | **Features of the 2nd Design that Need Improvement** |
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| **Presentation**  Decide upon the format of your presentation (i.e. poster, commercial, powerpoint, etc.).  List the points that you will make to convince the audience of the benefits of your chosen design.  List names and presentation tasks for each team member. |
| **Format:**  **Rationale for the design decisions (the points you will make in the presentation):** |

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| **Evaluation of System Features** | | | | |
| Audience members will rate the following features of the hydroponics system based on the criteria. | | | | |
| **Feature of the System—Based on Criteria for Success** | **Problematic Design**  **1** | **Average workable Design**  **2** | **Highly Effective Design**  **3** | **Comments/Advice for the Designers** |
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**Examples of possible features to include in the rubric:** system fits in the window space, system provides space for two lettuce plants, stable system that does not fall over, opening to replenish water is easily accessible, wicking provides enough water to plants, system does not leak, plants have grown at least \_\_\_\_\_ cm.