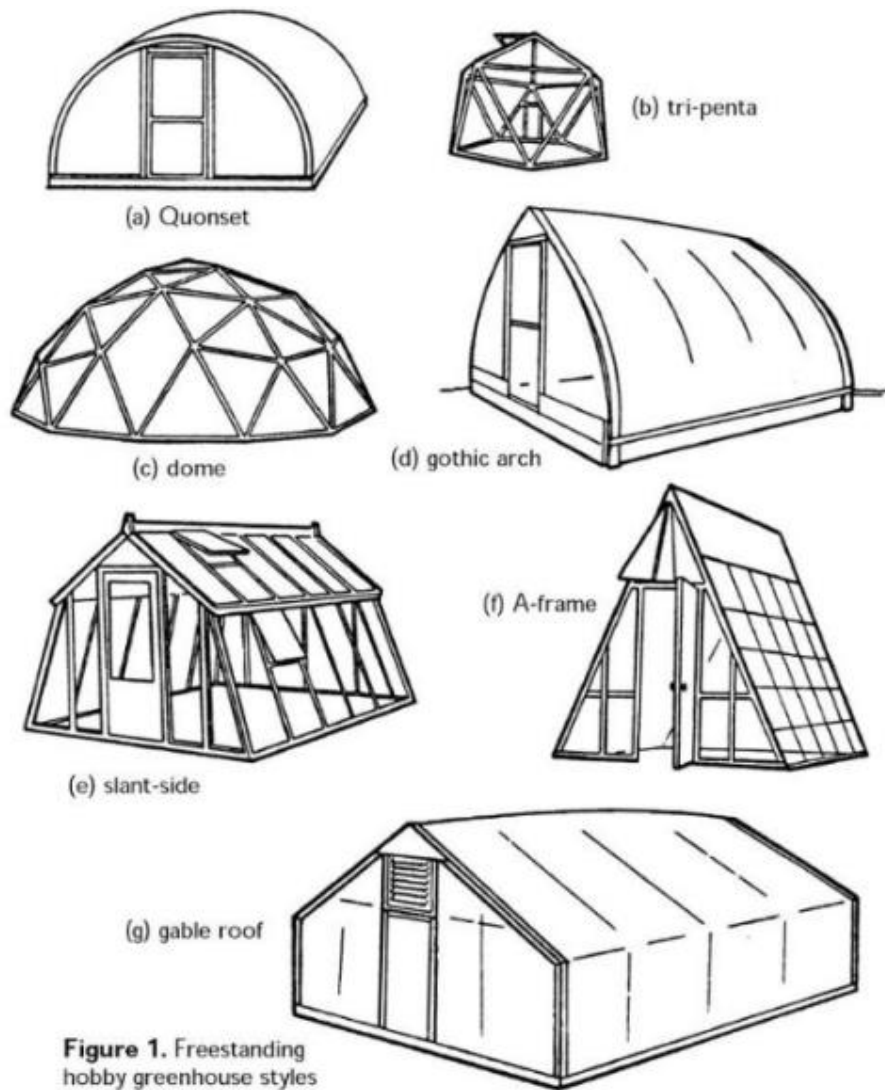


## Greenhouse Design & Testing Worksheet

**BACKGROUND:** Greenhouses are used in agriculture because they stay warm inside, even during the cold months. They are typically made of glass or some type of translucent material. As the sun shines on the greenhouse, the temperature inside increases, but the heat is trapped so it can't escape. As a result, greenhouses can prolong the growing season, making it possible to grow plants during the times of the year where the plant would otherwise freeze or die. Greenhouses are also used to grow young plants called seedlings because of the preferable environment.

**SUGGESTED MATERIALS:** Plastic (kitchen) wrap, cut up plastic water bottle, plastic straws, toothpicks, pipe cleaners, popsicle sticks, twist ties, wire, cardboard, mini marshmallows, hot glue, glue, construction paper, etc

Step 1 -  
Select a  
greenhouse  
to design  
from the  
images  
A - G



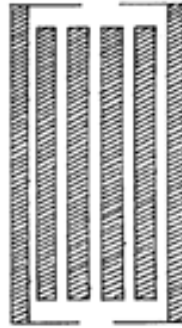
S

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# Interior Layouts of Greenhouses

Step 2 -  
Select a best  
bench  
arrangement  
based on your  
greenhouse  
design from  
the images

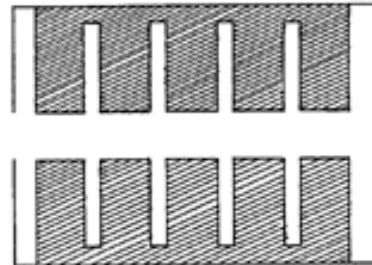
Lengthwise Benching  
(Longitudinal)



Crosswise Benching  
(Island)



Peninsular Benching



**Answer these questions:**

Bench Selection chosen:

Why do you believe this is the best bench arrangement for your greenhouse?

### Step 3 – Design

In the space below, provide a simple sketch of your model greenhouse.

**Sketch:**

**Label on your above plan the following items:** Please label these various items clearly or use a legend/key.

*\*\*Note\*\* not all greenhouse structures will have all the following*

Benches (arranged correctly)	Irrigation Lines
Fan (1 or 2)	Irrigation Controls
Cooling Cell	Glazing Material (type)
Interior Fans	Watering Faucets and Drainage
Thermostats	Heater

*\*\*Bonus points for adding plants and other fun creative features not listed above*

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#### Step 4 – Building your Model Greenhouse

. This greenhouse is to be built on a model scale. Supplies that may be used are plastic (kitchen) wrap, cut up plastic water bottle, plastic straws, toothpicks, pipe cleaners, popsicle sticks, twist ties, wire, cardboard, mini-marshmallows, glue, hot glue, etc. *Use your imagination.*

- ✓ The greenhouse must include a frame, covering and a simulated floor covering.
- ✓ You also must make mock tables, irrigation, heating and cooling elements – all items from your initial drawing on the previous page.
- ✓ All items in your greenhouse scale must be labeled.



#### Step 5 – Testing

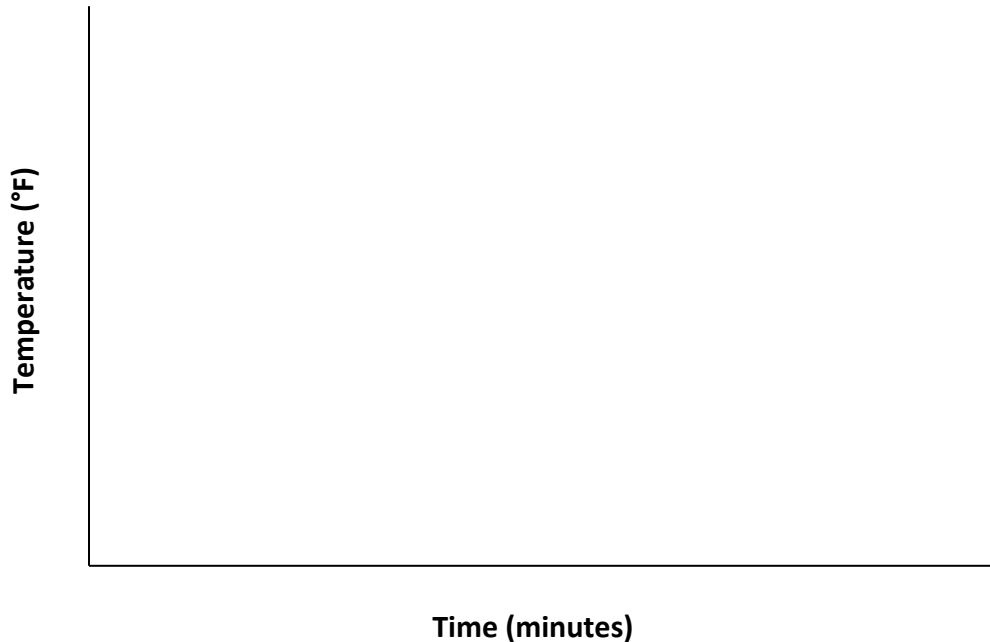
Determine the ambient (actual) temperature of the outdoor air. Place your greenhouse under direct sunlight with the thermometer inside. At each specified time interval, take a temperature reading inside the greenhouse. Also keep a record of the ambient outdoor temperature at the same time intervals.

Elapsed Time (minutes)	Inside Greenhouse Temperature (°C)	Outside Greenhouse Temperature (°C)
0 minutes (ambient outdoor temperature)		
5 minutes		
10 minutes		
15 minutes		
20 minutes		
30 minutes		
45 minutes		
60 minutes		

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### Step 6 – Graph the Results

On the axis below, plot the temperature readings inside and outside your model greenhouse as a function of time. Make the two lines different colors and include a legend to explain what the two colors represent. Make sure to include a title and appropriate labels.



### Step 7 – Analysis

- A. Looking at your graph, how does the temperature condition in your greenhouse compare to the ambient temperature of the air?
- B. Explain the general shape of the lines on your graph and what they mean in terms of the performance of the greenhouse. What do the two different lines indicate?
- C. Evaluate your greenhouse creation. How did your results compare to your expected outcomes?
- D. What are some ways you could have improved your greenhouse design? What changes need to be made?

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# Mini-Greenhouse Design

Student Names: \_\_\_\_\_

CATEGORY	5	3	2	1
Use of Class Time	Used time well during each class period. Focused on getting the project done. Never distracted others.	Used time well during each class period. Usually focused on getting the project done and never distracted others.	Used some of the time well during each class period. There was some focus on getting the project done but occasionally distracted others.	Did not use class time to focus on the project OR often distracted others.
Greenhouse - Originality	The greenhouse constructed reflects a exceptional degree of student creativity in their creation and/or display.	One or two of the elements reflect student creativity in their creation and/or display.	The greenhouse is made by the student, but are based on the designs or ideas of others.	No originality at all
Required Elements	The greenhouse includes all required elements	All but 1 of the required elements are included on the greenhouse.	All but 2 of the required elements are included on the greenhouse.	Several required elements were missing.
Attractiveness	The greenhouse. is exceptionally attractive in terms of design, layout, and neatness.	The greenhouse. is attractive in terms of design, layout and neatness.	The greenhouse. is acceptably attractive though it may be a bit messy.	The greenhouse. is distractingly messy or very poorly designed. It is not attractive.
Plan	Plan is neat with clear measurements and labeling for all components.	Plan is neat with clear measurements and labeling for most components	Plan provides clear measurements and labeling for most components.	Plan does not show measurements clearly or is otherwise inadequately labeled.
Modification	Clear evidence of troubleshooting, testing, and refinements based	Clear evidence of troubleshooting, testing and refinements.	Some evidence of troubleshooting, testing and refinements.	Little evidence of troubleshooting, testing or refinement.
Construction - Materials	Appropriate materials were selected and creatively modified in ways that made them even better.	Appropriate materials were selected and there was an attempt at creative modification to make them even better.	Appropriate materials were selected.	Inappropriate materials were selected and contributed to a product that performed poorly.
Construction - Care Taken	Great care taken in construction process so that the structure is neat, attractive and follows plans accurately.	Construction was careful and accurate for the most part, but 1-2 details could have been refined for a more attractive product.	Construction accurately followed the plans, but 3-4 details could have been refined for a more attractive product.	Construction appears careless or haphazard. Many details need refinement for a strong or attractive product.
Labels	All items of importance on the greenhouse are clearly labeled or there is a key.	Almost all items of importance on the poster are the greenhouse are clearly labeled or there is a key.	Several items of importance on the greenhouse are clearly labeled or there is a key.	Labels are too small to view OR no important items were labeled.
Answers to Questions	Questions answered thoroughly, included details and terms learned in class	Questions were answered correctly but lacked enough detail to be considered thorough	Questions were incorrect or answered without detail and did not use terms	Questions were not answered or were extremely vague.

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