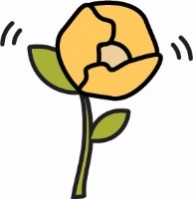


**Macronutrients:** plants need a balanced **NPK Ratio** to thrive.

**Potassium** **(K)**  
- amino acids  
- carbohydrates

**Phosphorus (P)**   
- stems  
- roots  
- flowers

**Nitrogen (N)**   
- leaf growth  
- leaf color  
- chlorophyll synthesis





**Micronutrients:** plants also require other nutrients, including:   
 calcium (Ca), magnesium (Mg), and sulfur (S)  
 boron (B), zinc (Zn), copper (Cu), and iron (Fe.)

**Feed Me, Seymour!**



Nutrients in soil are easily exhausted. **Hydroponic Systems,** however, have the benefit of “feeding” plants directly.   
This reduces waste, **concentrating** nutrients for specific purposes, such as added Phosphorus for brighter blooms.

1. What macronutrient would you add to the   
    **NPK ratio** to maximize leaf growth? \_\_\_\_\_\_\_\_\_\_\_\_\_
2. How quickly your plants flower? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. How strong your roots grow? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**

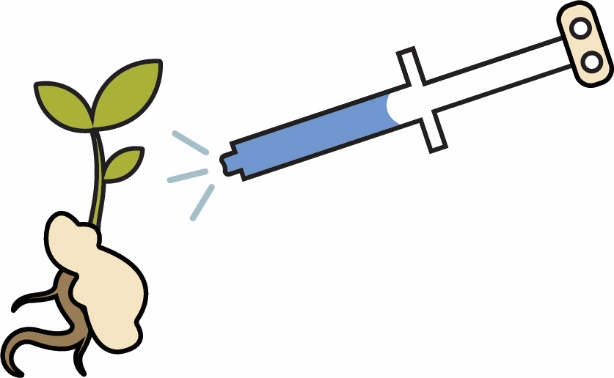
Using **commercial solutions** (FloraMicro, FloraGro) or your own mixes,   
determine the **NPK Ratio** of the solution. Certain brands contain more   
of one element; note this and develop a **formula** (independent variable)   
to best aid an aspect of the **plant’s** **growth** (dependent variable).

**Example:** A formula with more **Nitrogen** (N) will cause my plant to   
 grow more leaves than the **control** (water-only formula).

Record your ratio percentages, pH levels and observations.   
Then, plot your plant’s progress graphically to observe changes over time.



**Note:** *Experimenting with DIY Nutrient Solutions,   
 such as used tea bags or recycled fish tank water,  
 is encouraged, but be warned! Adding your own  
 substances could potentially hurt the plant.*

**Lab Supplies:**

* Micro Hydroponic System
* Planted seedling in growing medium

**Quick Tip:**  
Use a cylinder or   
eye-dropper to better measure   
out the solution.

* Nutrient Solution(s)
* pH Test Kit or Litmus Strips – optional
* Container or cup for fluids
* Disposable gloves - optional

Name(s): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
Set: \_\_\_\_\_\_\_\_\_\_\_\_\_

Record the height, pH and growth observations each day,   
along with the NPK Ratio percentage in the nutrient solution.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Day** | **NPK Ratio** | **Height** | **pH** | **Leaf & Flower**  **Growth** | **Observations** |
| 1 |  |  |  |  |  |
| 2 |  |  |  |  |  |
| 3 |  |  |  |  |  |
| 4 |  |  |  |  |  |
| 5 |  |  |  |  |  |
| 6 |  |  |  |  |  |
| 7 |  |  |  |  |  |
| 8 |  |  |  |  |  |
| 9 |  |  |  |  |  |
| 10 |  |  |  |  |  |

  
 Set: \_\_\_\_  
 Name(s): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Plot the height of your plant on the graph below.  
**NPK Ratio** **%**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**The Effect of Nutrient Solution on Plant Height Over Time**

Plant Height

(Dependent Variable)

15cm

14cm  
13cm

12cm

11cm

10cm

9cm

8cm

7cm

6cm

5cm

4cm

3cm

2cm

1cm

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| Day 1 | Day 2 | Day 3  Daily Plant Measurement  (Independent Variable) | Day 4 | Day 5 | Day 6 | Day 7 | Day 8 | Day 9 | Day 10 | Day 11 | Day 12 | Day 13 | Day 14 |

Name(s): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Draw and Record your Growth Observations below.

Add to your *Engineering Notebook*.

*How many leaves grew on the stem? What was the width of the flowers?   
 Did they all bloom the same color?*