

ACTIVITIES AND EDUCATIONAL  
MATERIAL

# HYDROPONIC *Gardening*



Make hydroponic gardening fun with informative activities  
and projects!

Worcester Polytechnic Institute  
El Gandul Community Center

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# PREFACE

## Purpose and Introduction



The student IQP team from Worcester Polytechnic Institute developed this manual in Spring of 2024 with guidance from the El Gandul Community Center and La Fondita de Jesus.

This manual contains a number of activities and lessons regarding hydroponics and gardening in general. The manual is split into 2 sections:

- 1) Brief lessons and demonstrations
- 2) Activities related to hydroponics

In utilizing this manual, we hope that users will feel more connected and familiar with hydroponics and gardening and find the benefit of growing healthy food.

The demonstrations and lessons benefit people of all ages looking to be involved in hydroponics. There are games and jokes for younger audiences, as well as recipes and DIY projects for adults.

Special acknowledgments to José Ramírez, Mark Wilson, Dr. Grant Burrier, and Dr. Scott Jiusto



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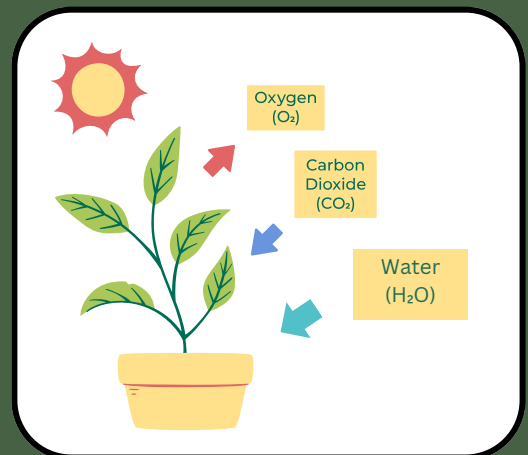
Recipes



# HOW DO PLANTS GROW?

## PHOTOSYNTHESIS & PLANT PARTS

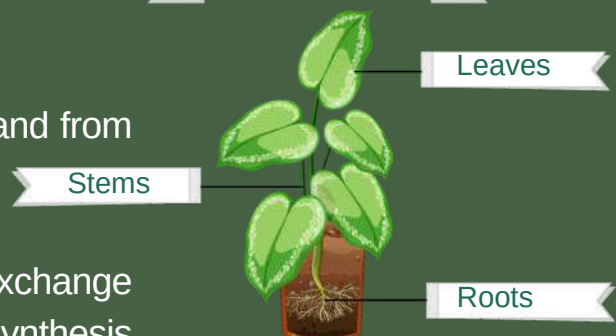
*Photosynthesis* is the process where plants utilize energy from the sun to create their own food source (glucose). Plants absorb water and carbon dioxide, and transform these elements into oxygen and glucose, a type of sugar. Oxygen is released back into the air, and glucose is stored for energy.



### Plants Parts:

- Roots
  - Anchors plant and absorb nutrients & water from surroundings. In hydroponics, roots appear shorter since it's easier for plants to access their essential nutrients, compared to soil farming.
- Stem
  - Its purpose is to transport water and nutrients to and from the roots to leaves, branches, and flowers.
- Leaves
  - Gather sunlight, store water, location where gas exchange (between carbon dioxide and oxygen) and photosynthesis occurs.

### Plant Parts



## REVIEW QUESTION:

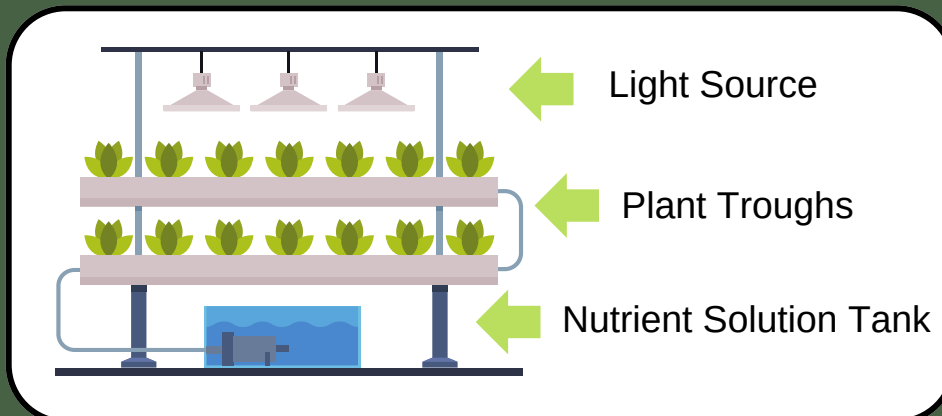


Where on the plant does photosynthesis occur?

## LESSONS AND EDUCATIONAL MATERIAL

# HYDROPONICS 101

## Basics of Hydroponics



Hydroponics is a soilless gardening technique that uses a flowing nutrient-water system to grow plants like cilantro, spinach, and tomatoes. Proper nutrient distribution, pH control, and water flow allow for plant cultivation. Nutrients (calcium, magnesium, iron etc.) are mixed with and dissolved into water to create a nutrient solution. This solution is powered by a pump, which pushes the solution through plant troughs with holes. Each hole houses one plant. A light source is also necessary, whether it is the sun or a hydroponic lamp.

“Hydro-” + “-Ponics”  
= water work

## REVIEW QUESTION:

What are the major differences between hydroponic gardening and soil-based gardening?



# PLANT LIFECYCLE

## From Seed to Harvest



1

### STEP 1

#### Seeding/Germination

Place seeds in germination tray (oasis). Give the seeds plenty of sunlight and water. Watch them sprout after a week!

### STEP 2

#### Transplanting

After the proper germination time, break apart the foam oasis cubes apart so each seedlings are separated. Place the separated cubes in the PVC plant trough hole. The plants will live here now!

3

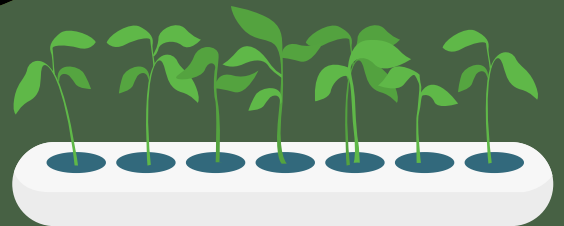


### STEP 3

#### Harvesting

When fully grown, the plants are ready to harvest for food! Harvest the produce by pulling from the roots. Cut any excess roots off.

2



## REVIEW QUESTION:



At what step are the PVC plant troughs used?

# HYDROPONIC MILESTONES

## Basic Steps of Hydroponic Gardening



1

### STEP 1

#### Seeding/Germination

Fill the holes in the oasis/foam board with about 8 to 10 seeds. Then, place the foam in a small puddle of nutrient-infused water on an outdoor tray. But protect them from the rain.

### STEP 2

#### Transplanting

Carefully break up each oasis/foam square that has a plant inside. (Try to fold the foam, not pull it apart.) Then place each foam square inside a hole in the hydroponic garden.

2



3



### STEP 3

#### Harvesting

Slip fully grown plants out of the hydroponic tubes by the base of their stems with both hands. Cut off large roots if necessary.

## ACTIVITY

# DIY HYDROPONIC

2

## 2 Liter Soda Bottle Hydroponic System

### Materials

2-liter bottle  
Growing media (coconut coir)  
Water  
Wicks or a wicking material  
(Felt or cotton towels)  
Aluminum foil  
Nutrients  
Permanent marker or sharpie  
Scissors  
Seeds  
Duct Tape (optional)  
Optional: pH test kit  
Optional: Seed starters

### QR Code to Instructional Video



To set captions in Spanish:  
Settings >> Subtitles >> Auto-  
Translate >> Spanish

### Instructions

- 1) Rinse 2-liter bottle and draw a line below the curved part of the bottle, right when it straightens out.
- 2) Cut along the line and flip the top piece you've cut and fit into the body of the bottle.
- 3) Adjust the pH of tap water to 6.0-6.5 using pH down.
- 4) Add nutrients to a sample of the pH-adjusted water. Add nutrient sample to 2-liter bottle.
- 5) Fill bottle with pH-adjusted water until it touches the cap of the flipped top piece.
- 6) Thread the wicking material through the cap.
- 7) Pack the top part of the bottle with growing media.
- 8) Plant seeds



**Purpose:** Create a small-scale hydroponic to illustrate the convenience of hydroponics. Connect how growing plants creates food for the community.

Sourced from  
<https://www.epicgardening.com/hydroponics-for-kids/>



← **ACTIVITY** →

# JOURNAL



NAME \_\_\_\_\_

DATE \_\_\_\_\_

TYPE OF PLANT \_\_\_\_\_

MY PLANT'S NAME \_\_\_\_\_

PLANT GROWTH STAGE \_\_\_\_\_

OBSERVATIONS \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Drawing of My Plant  
Today

HOW IS MY PLANT FEELING?



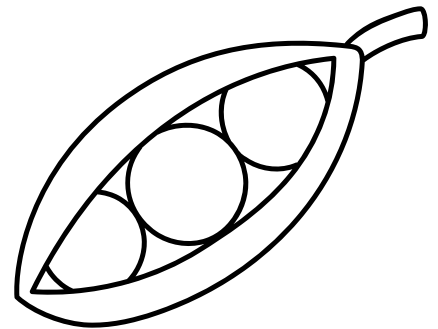
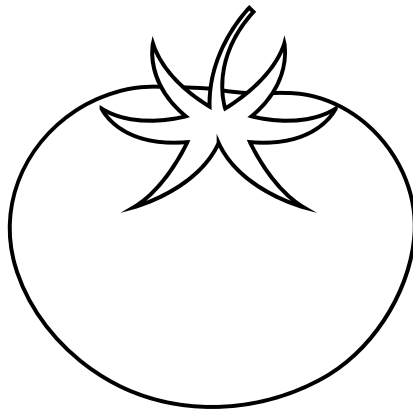
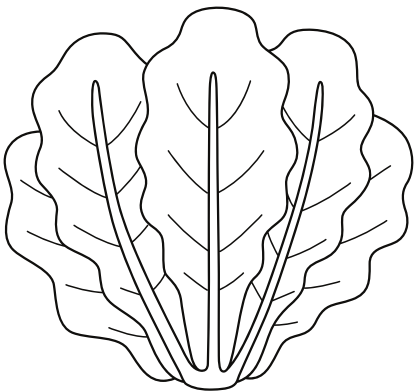
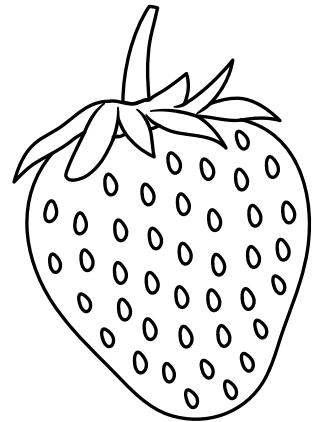
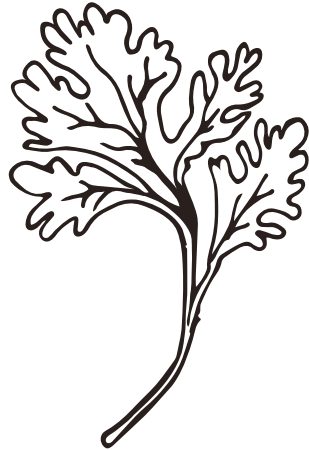
ACTIVITY

# COLORING



1

## Food Grown from Hydroponics



### Riddle

Why doesn't the tomato drink coffee?

Because he likes tea-matoes better.



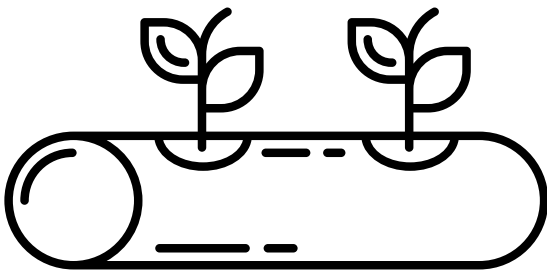
ACTIVITY

# COLORING

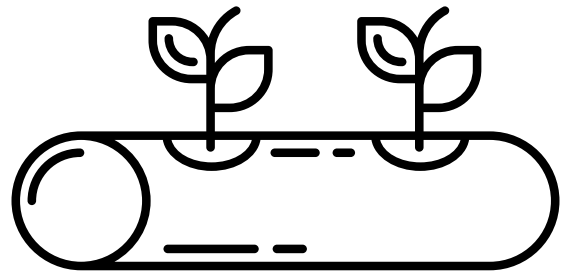
2

## Predicting Plant Leaves

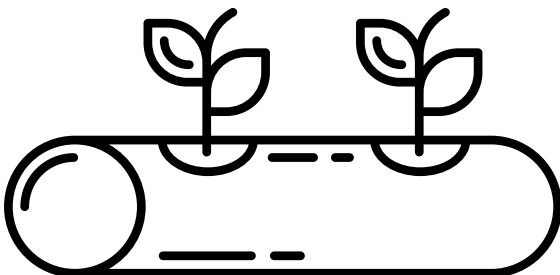
What will the leaves look like when:



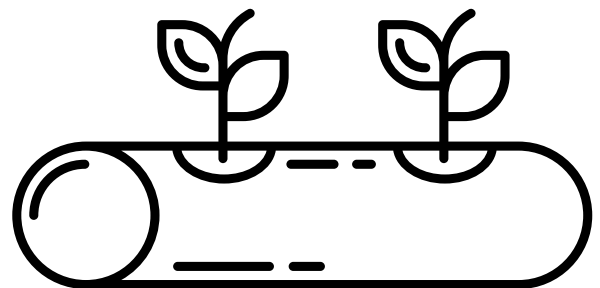
pH is too high (basic)



pH is too low (acidic)



Calcium is too low



Plant has pests

Riddle  
What does a plant say to another plant?

¡Hoja, cómo estás!



## ACTIVITY

# CROSS WORD



1

Find the words:

plants, trees, flower, light, water, air, leaf, fruit, stem, herb, roots, and ground.

p	l	a	n	t	a	s	e	r	t	y
b	h	r	f	d	s	f	l	o	r	p
g	s	b	c	a	e	v	u	d	r	f
p	r	o	d	g	o	a	z	t	w	n
r	j	l	i	u	e	s	v	h	r	g
a	f	e	e	a	i	r	e	o	j	f
i	g	s	a	g	o	k	m	j	h	r
c	w	r	h	i	e	r	b	a	z	u
e	c	z	d	l	o	b	f	r	s	t
s	u	e	l	o	d	t	a	l	l	o

Credit: Webquest Creator 2. <https://webquestcreator2.com/majwq/ver/verp/53931>

\*accents msising

\*across and down



# ACTIVITY

# CROSS WORD #2



(a little more difficult)

Find the words:

**source, cilantro, hydroponic, nitrogen, calcium, magnesium, phosphate, and potassium.**

p	l	a	c	d	c	s	h	r	t	b
b	m	r	f	i	a	f	f	o	r	p
g	a	b	c	a	l	m	u	j	r	o
p	g	f	d	j	c	a	e	t	w	t
r	n	e	o	n	i	s	n	p	r	a
y	e	o	l	s	o	r	t	t	w	s
i	s	s	a	b	f	i	e	w	r	i
h	i	d	r	o	p	o	n	i	c	o
e	o	z	d	a	o	b	r	r	s	t
n	i	t	r	o	g	e	n	o	w	o

Original work

\*There are more word searches online

\*across, down, and diagonal

\*missing accents

ACTIVITY

# RECIPES



COOKING WITH CILANTRO

## ACTIVITY

# CILANTRO SOFRITO



### Ingredients

- 2 Green cubanelle peppers (or bell pepper)
- 1 Red cubanelle pepper (or bell pepper)
- 3 Small onions or 1.5 large onion
- 1 Bunch of cilantro
- 1 Bunch of recao (culantro)
- 1 Tbsp of dried oregano
- 1–2 Bulbs of garlic
- Olive Oil (optional)



### Instructions

1. Wash and roughly chop all of the vegetables and herbs.
2. To a blender, add the bell peppers and blend until they liquify.
3. Next, add the onion, cilantro, recao, dried oregano, and garlic to the blender.
4. Blend until smooth. If you're having trouble blending, add a bit of olive oil until you achieve your preferred consistency.
5. Store in the refrigerator for up to two weeks or in the freezer for several months.

Link to recipe: <https://www.diningtraveler.com/2022/02/how-to-make-sofrito-puerto-rican-style-at-home.html>



## ACTIVITY

# CILANTRO RICE



### Ingredients

- 1 cup long grain rice
- 2 cups chicken or vegetable broth
- 2 tablespoons finely chopped white onions
- 1 garlic clove minced
- ½ cup chopped fresh cilantro
- ¼ teaspoon ground cumin
- Salt to taste
- 2 tablespoons butter



### Instructions

- Place ½ cup of the chicken broth with the cilantro and cumin in the blender. Blend until well combined and set aside. Heat the butter over medium temperature in a medium pot.
- Add the onions and garlic, and cook until the onions are soft for about 2 minutes.
- Add the rice and stir it well, add the cilantro mixture and the rest of the broth and bring it to a boil.
- Let the liquid reduce until it barely covers the rice, cover with a lid, reduce the temperature to low, and cook for about 20-25 min.

Link to recipe:

<https://www.mycolumbianrecipes.com/arroz-con-cilantro-cilantro-rice/>

