

# Frayer Model

<i>Definition (in own words)</i>	<i>Characteristics</i>
<i>Examples (from own life)</i>	<i>Non-Examples (from own life)</i>

*Plants*

# Plants In Our Lives

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For us to breath and grow, we need \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.

Plants are able to provide us \_\_\_\_\_ through photosynthesis and plants provide \_\_\_\_\_ for us directly or indirectly when animals we eat grow by eating plants.

Plants also provide comforts that help improve our lives.

Draw below some of the plants and plant products that you encounter in your life.

# Ornamental Horticulture

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Key words: aesthetic cross-pollinate cultivate desirable  
environment foliage grower horticulture hybrid optimize

In the beginnings of Agriculture, plants have been selected for their desirable traits. Whether it be their sweeter or more nutritious fruits, their more abundant harvests, their vigor to grow, their ability to weather temperature extremes, and/or their ability to be more disease or pest resistant.

Horticulture is derived from the Latin hortus (garden) and cultura (cultivation). The purpose of Ornamental Horticulture is to cultivate plants to enhance the environment aesthetically and/or functionally.

Questions:

Can you think of ways in which plants beautify their surroundings?

How would you use plants for a functional purpose?

The plants in our gardens were originally found in their natural habitats throughout the world. As plant enthusiasts explored new environments they saw plants with desirable traits or an exotic look and brought back seeds to germinate, plant leaves to propagate, or whole plants to enjoy in their homes and gardens. Plant breeders cross-pollinate flowers to produce plant cultivars with more desirable traits. A cultivar is a contraction of the terms Cultivate and Variety. While similar to the native plant species, the plants produced by the plant breeders might have a wider spectrum of colors or more distinct qualities of foliage.

Nurseries and Greenhouses commercially grow plants for people to purchase for their homes and gardens. When growing these plants, it is important to simulate their native environments to help optimize plant growth. Growers will alter light, humidity, temperature, irrigation (watering) cycles, fertilizer (plant nutrients), carbon dioxide levels, and soil composition. They might also treat the plants or alter the length of light exposure to initiate flowers or delay flowering. Bromeliads need ethylene (a by-product of leaf decomposition) to initiate flowers. Chrysanthemums need black cloth in the summer to shorten the day length to initiate flower and lights in the winter to prevent flowering.

# Ornamental Horticulture Scramble Game

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There are 7 key elements to a plant's growing environment.  
Unscramble the following words to find out!

Example:

RONBAC XIOEDID VEELLS >>>> CARBON DIOXIDE LEVELS

Now, it's your turn....

1. TIIMHYDU >>>> \_ \_ \_ \_ \_
2. ORINGTAIIR ELYCC >>>> \_ \_ \_ \_ \_
3. PUREETATERM >>>> \_ \_ \_ \_ \_
4. TLGHI >>>> \_ \_ \_ \_ \_
5. SILO TINMOOSIPCO >>>> \_ \_ \_ \_ \_
6. ZIRLIFTREE >>>> \_ \_ \_ \_ \_

## Overview

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1. Light - is required for photosynthesis. Some plants may burn when the light levels are too intense because of the high levels of chlorophyll in the leaves. In some plants, day length will determine the onset of flowers
2. Humidity - plants that tend to have high transpiration rates (water loss through the leaves) require higher amounts of moisture in the air.
3. Temperature - regulates the rate of plant growth. Different plants have optimum temperature ranges. Cold can cause damage while in some plants it will trigger flowers to bloom.
4. Irrigation Cycles - some plants prefer to dry out slightly between watering others need consistent moisture.
5. Carbon Dioxide - is needed in photosynthesis to build the sugars needed for plant growth. Some plants benefit from additional carbon dioxide.
6. Soil Composition - allows the grower to adjust the level of moisture and aeration around the roots. Organic material stays wet. A coarse mix will allow more air spaces around the roots.
7. Fertilizer - provides the plant the extra nutrients it needs for proper maintenance and growth.

# Indoor Plants

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Many of the plants that successfully grow in our garden are from similar climates. In Southern California, these plants may be native to other Mediterranean Climates in Western Europe, in South Africa, Australia and New Zealand, as well as the Western portion of South America. While we may also have plants from other places, these plants have lived in a similar climate to ours and have adapted to it's weather patterns - dry summers and wet winters, mild temperatures, and day and night temperature differences. They tend to be more successful because of these adaptations.

In looking for a region to find indoor house plants, where on the earth would you look for a similar environment?

## Comparison Activity

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Let us evaluate our home environment - circle the condition which applies

Light -

1. Bright with direct sunlight
2. Dark with filtered sunlight

Temperature -

1. Hot during the day, cold at night
2. Comfortable and warm day and night

Humidity (moisture in the air) -

1. Very dry as in a desert
2. Very wet during in the rain
3. Not too dry, not too wet

Can you think of a climate that would have these types of conditions?

Hint: If you lived in a tent over a whole year, would you find the most comfort in a hot desert? In the cold tundra near the icy waters in Canada? Would it be outside your house through the summer and winter? Or maybe somewhere more tropical?

# Indoor Plants

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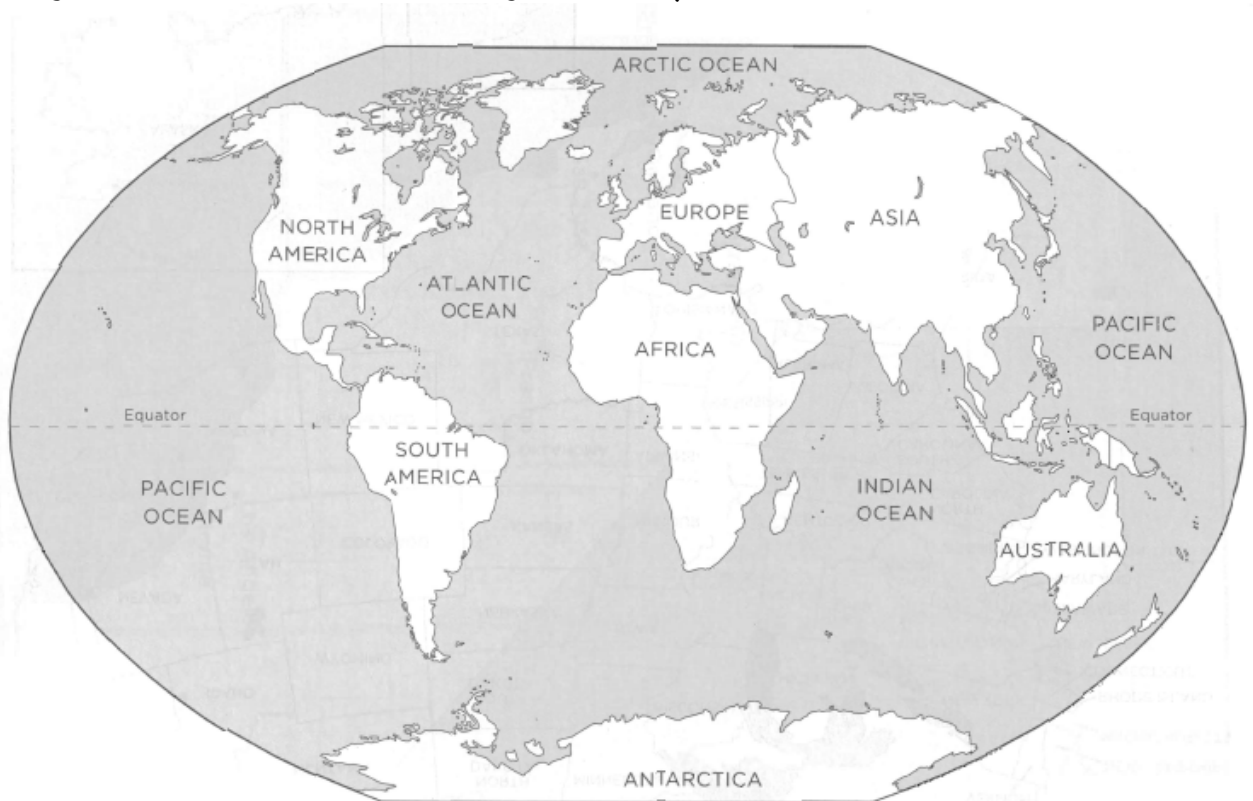
Many indoor plants are found in the tropics. Here the temperatures are warm, the tall canopy of towering trees allow small amounts of filtered light to pass through to the floor of the forest. The rains and the flowing waters of the rivers provide humidity. The soils are rich with decomposing organic matter from the surrounding animal and plant life.

The climate of the tropics most closely matches the climates inside our indoor environments. With their ability to thrive in low light, preference for moderate temperatures and humidity, Tropical Plants are the perfect candidate for indoor environments. In the tropics, they have adapted to their low light environments by having great photosynthetic levels - meaning they continue to grow even when they receive very little light.

## Activity

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Using What is in a Name Activity, identify on the classroom's world map the countries or regions where these plants have originated from. You may color in the areas using the map below.



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# Activity – What is in a Name

In the process of classifying plants, groupings of plants are given a scientific name. This name may reflect characteristics of the plant or that recognizes a person that has been influential.

Using the word bank of scientific names, write the scientific name corresponding to the root words describing the plant or honoring a person.

**Word Bank:** Aglaonema Anthurium Bromeliad Chamaedorea Chlorophytum Codiaeum Ctenanthe Dieffenbachia Dracaena Guzmania Maranta Neoregelia Nephrolepis Philodendron Spathiphyllum Vriesea

	<b>From the Greek words ktenis “comb” and anthos “flower”</b> Native to the tropical rainforests of South America, namely Brazil
	<b>From the Greek words anthos “flower” and oura “tail”</b> Common Name – Flamingo Flower. Flower made up of a spathe and spadix tail. Native to the wet humid areas of northern South America
	<b>Named after A Guzman a 18th-century Spanish apothecary (pharmacist) and botanist</b> Native to the West Indies, Central and South America – namely Andean cloud forests of Colombia and Ecuador
	<b>From the Greek words philen “to love” and dendron “tree”</b> Native to the rain forests of Central and South America, this plant likes to climb up trees.
	<b>Named for Edouard August von Regel, botanist and director of St. Petersburg Botanic Gardens in Russia</b> Native to Brazil and the Amazon.
	<b>Named after the Malaysian name for the plant Codebo</b> Common Name – Croton Tropical shrubs, their leaves are colorful – green with shades of pink, yellow, orange, red to almost black Native to the Moluccan Islands between Philippines and New Guinea
	<b>Named after Bartolomeo Maranta a 16th-century Italian botanist</b> Common Name – Prayer Plant Native to the tropical regions of America
	<b>From the Greek words spathe “blade” and phyllon “leaf”</b> Common Name – Peace Lily Native to tropical America and the Indian archipelago
	<b>Named for Willem Hendrik de Vriese, Dutch botanist and physician</b> Native to Brazil

# Activity – What is in a Name

	<p><b>From the Greek words chamai “drawf, low” and dory “spear”</b>  Common Name – Parlor Palm  Native to Central America Neathe Bella Palm is native to Mexico</p>
	<p><b>From the Greek word drakaina “dragon”</b>  Common Name – Dragon Tree  Dracaena draco has a red sap associated with dragon’s blood  Native of the Canary Islands, tropical and subtropical Africa, Asia, and the archipelago between Asia and Australia</p>
	<p><b>From the Greek word nephros “kidney” and lepsis “scale”</b>  Common Name – Ladder Fern  Distributed over tropical regions all over the world</p>
	<p><b>Named after Swedish botanist Olof Bromel</b>  Family includes the Pineapple which Columbus introduced to Europe upon returning from his voyage to the Americas.  Native to the tropical and sub tropical regions of North, Central, &amp; South America.</p>
	<p><b>From the Greek word chloro “green” and phyt “plant”</b>  Common Name – Spider Plant  Describes the clusters of hanging plantlets called spiders  Native to Africa, Asia, Central &amp; South America</p>
	<p><b>From the Greek words aglaos “brilliant” and nema “thread”</b>  Common Name – Chinese Evergreen  Native to southeast Asia – Malaysia, Thailand, Philippines – lowest elevations, from the humid, heavily shaded tropical forests</p>
	<p><b>Named after German physician and naturalist D. Ernest Diffenbach</b>  Common Name – Dumb Cane  Native to tropical America from Costa Rica to Colombia, in the moist, lowland tropical forests</p>

**Word Bank:** Aglaonema Anthurium Bromeliad Chamaedorea Chlorophytum Codiaeum Ctenanthe Dieffenbachia Dracaena Guzmania Maranta Neoregelia Nephrolepsis Philodendron Spathiphyllum Vriesea

Bromeliads (Guzmania, Neoregelia, Vriesea), Anthurium, Nephrolepsis might be found either growing on the ground or attached to trees. Plants growing on trees are referred to as Epiphytes – from the Greek words epi “upon” and phyte “plant”. Plants growing on the ground are referred to as Terrestrial – from the Latin terra “land” or “earth”. Epiphytes use their roots to attach to the trunks of trees and collect their water from the moisture in the air.



# Greenhouse Production

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Growing within a greenhouse allows a grower to control the environment while offering protection from the outside environment. Greenhouses protect plants from being damaged by cold, heat, direct sunlight, wind, and precipitation (rain, snow, hail).

Tropical plants are greenhouse grown to create a controlled environment. The greenhouse protects the plants from environmental extremes and regulates the light, temperature, and humidity levels to create an optimum environment for the plants to grow.

Through Photosynthesis, the plant takes in carbon dioxide and water transforming these compounds into oxygen and sugars. These sugars are utilized by the plant to grow. In order to grow plants more quickly, the light levels need to be as high as possible without leaf temperatures becoming too hot which would cause the plant to burn and show stress.

Insulation in the walls and double poly roofs in the greenhouse help maintain consistent temperatures in the greenhouse. Holding in heat at night and reflecting heat during the day by reflecting infrared light. Moreover, it reflects damaging ultraviolet light and optimizes the light spectrum that plants need to grow.

Energy curtains at the top of the greenhouse are open in the morning and in the late afternoon to allow additional light into the greenhouse when the sun is low on the horizon. During the day when the light is at its peak, the curtains close to shade the plants and will also close at night to maintain an extra barrier trapping additional heat in the greenhouse.

To cool the greenhouse temperatures, water passes over cooling pads made of cardboard. As the exhaust fans cause the air to pass through the pads, the water turns to water vapor which requires energy and causes the temperature to drop. The water vapor also produces additional humidity for the plants.

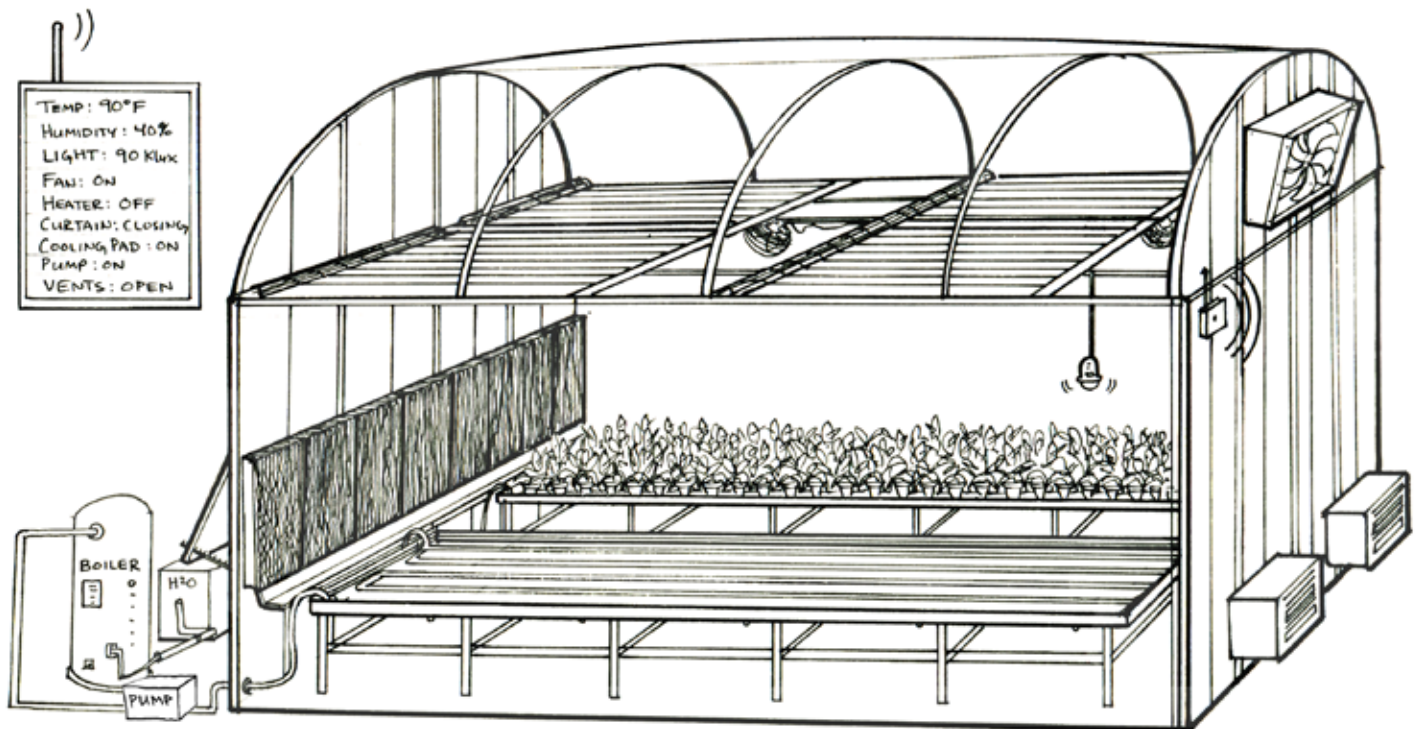
In order to maintain heat within the greenhouse, direct fired heaters blast heat into the greenhouse. Meanwhile fans circulate the air within the greenhouse, mixing the heat and helping to alleviate any hot or cold spots.

# Greenhouse Production *continued*

To propagate plants, it is important to maintain ample root temperatures, by running hot water through tubes underneath the pots, optimum root temperature may be maintained even with a lower air temperatures.

Temperatures within the greenhouse are maintained between 65F and 90F.

An environmental computer is used to regulate what happens within the greenhouse. It measures the relative temperature and humidity within the greenhouse as well as the outside light levels and temperatures. When it measures a condition outside the normal range, it calls upon the heaters, energy curtains, jet fans, cooling pad pumps and/or exhaust fans to respond and bring the greenhouse conditions back inside the proper parameters. If this system does not work and a condition drops to an unacceptable level, the computer will even place a call to the grower announcing there is an "Alert" that must be addressed. In addition to controlling the environment, the computer is able to maintain a regular irrigation schedule ensuring plants receive the proper regiment of water and fertilizer.

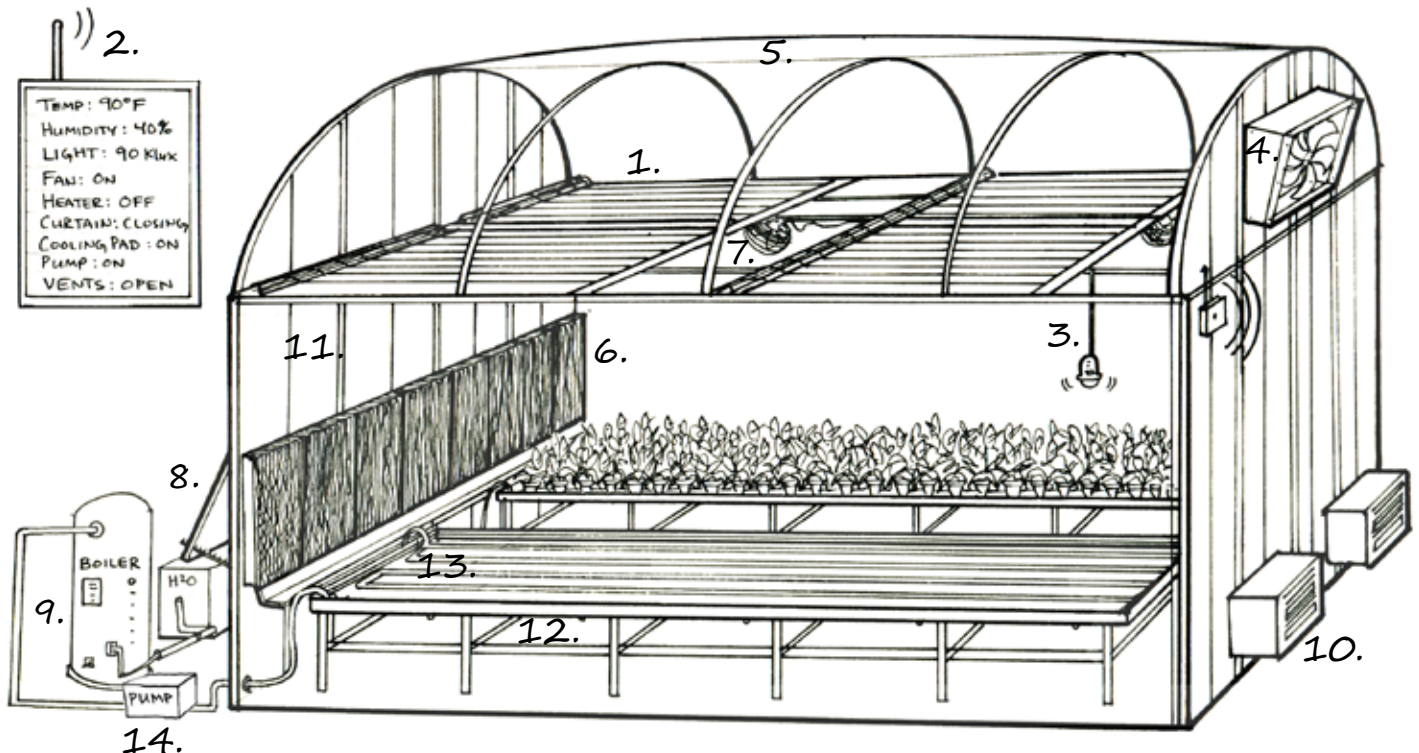


# Inside a Greenhouse

Match the elements that regulate the environment inside the greenhouse with their functions. Label the elements of the greenhouse

- A. Benches
- B. Boiler
- C. Cooling Pads
- D. Double Poly Roof
- E. Energy Curtains
- F. Environmental Computer
- G. Exhaust Fans
- H. Fans
- I. Heater
- J. Hot Water Tubes
- K. Insulated Siding
- L. Sensors
- M. Vents
- N. Water Pump

- 1. Shades plants during the day, holds in heat at night
- 2. Monitors the sensors output and tells machines to turn off and on to run greenhouse equipment
- 3. Detects light, temperature, and humidity levels
- 4. Exhausts air from the inside of the greenhouse to the outside
- 5. Holds in heat at night, reflects heat during the day by reflecting infrared light
- 6. Water passes over, absorbs energy while turning to water vapor cooling the air
- 7. Circulates the air within the greenhouse preventing cold or hot spots
- 8. Opens to allow air to pass through to the cooling pads
- 9. Makes hot water that will be pumped into tubes on the benches
- 10. Blasts heat into the greenhouse when it gets too cold
- 11. Keeps heat from being lost or gained through the walls
- 12. Elevates the plants above the ground improving air circulation below the plants
- 13. Lines the benches to keep the plant roots warm
- 14. Circulates cold water to the cooling pads or hot water from the boiler to the hot water tubes



# Activity – Plant Marketing

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Part of growing plants commercially is marketing the plants that you grow. Educating the customer about your plant material is important in order to empower them to make an informed decision on the type of plant they wish to purchase and to help them be successful growing and maintaining your plants.

In this activity, you will pick a plant and create point-of-purchase materials to promote your plant.

In promoting your plant, determine what makes this plant special.

- How is it unique?

- Is it an improved or new variety?

- Does it have a nice or distinctive attribute with its flowers, fruit, or foliage?

- Does it serve a particular function?

  - Does it make a nice gift for a special occasion?

  - Does it make a nice cut flower?

  - Does it repel (or consume) unpleasant insects?

  - Does it attract birds or butterflies?

  - Does it clean the air and/or improve the surroundings?

Tell the customer how your plant should be cared for.

- What are the light, temperature, and watering requirements?

- What type of soil and fertilizer does it need?

- How frequently does it need to be watered?

- You can be imaginative on how to care for your plant.

Pick a plant – real or imaginary. Draw up a picture to promote an unique attribute or a great use for your plant. Write a story about what makes your plant special and how you should care for this particular plant.

# Tropical Foliage Care Information

1.

Remember their  
native habitat



2.

Keep away  
from drafts



3.

Keep away  
from direct  
sunlight



4.

Check soil  
moisture  
 $\frac{1}{2}$  inch  
below the  
soil surface  
before  
watering.



6.

Plants  
improve  
creativity  
and  
productivity  
and are  
great  
homework  
helpers!



5.

Water 5-7 days,  
a measured  
amount of water.  
Approximately  
1c (8oz) for a 6" plant  
Don't drown.





# Tropical Foliage Care Information

When evaluating how to care for your plant, it is helpful to think about a plant's native environment. What temperatures, light, and humidity levels has the plant adapted to? What are the soil and moisture conditions?

Here are some general guidelines:

**Temperature** - Moderate temperatures between 55F to 85F. Keep away from drafts (fans, air conditioning and heating ducts) as they will tend to dry out faster.

If the plant is losing more water through transpiration than it is absorbing through the roots, the tensions of the cells decrease causing the plant to droop and wilt. On a warm day, plants need more water.

**Light** - Bright filtered light as the plants would experience under a canopy of trees. Do not expose to direct sunlight. Some plants like Aglaonema and Spathiphyllum will tolerate less light than others.

If light levels are too low, plants will lose some leaves and the remaining leaves will become darker as the plant increases the amount of chlorophyll in the leaves. Leaves will tend to stretch towards the light.

**Watering** - Before watering, check the moisture of the soil by placing your forefinger ½ inch below the soil surface. Plants like to be moist - not too wet or dry. Plants that have well developed root systems require more water than smaller plants with less roots. Start with 1c for an 6" pot, 2c for an 8" pot. Using a saucer allows the nutrients leached out by the water to be reabsorbed into the soil. If water is present in the saucer the next day, drain the excess water and use less water next time.

If plants are too wet, the roots will die because they do not have the air necessary for them to breathe and will not be able to sustain the life of the plant. Just like people, plants need water to drink and air to breathe.

**Soil** - Plants on the floor of the rainforest have rich, organic soils made of decaying animal and plant matter. Use a coarse potting mix when the plants get too big for their pots.

**Fertilizer** - A plant's need for fertilizer depends on the intensity of light (which affects photosynthesis rates) and whether it is actively growing. For indoor plants, you may fertilize during active growth every 2-4 weeks using a ¼ or ½ rate to prevent fertilizer from burning the leaves.