

## Lab 7 Plant Kingdom Pre-Lab Questions

1. Plants evolved from being entirely aquatic organisms to living on land. Describe 4 adaptation plants made in order to live successfully on land.

2. Which plants generally will grow taller, a vascular plant or a non vascular plant. Do you know why?

3. How are seeds an evolutionary advantage?

4. Are grasses gymnosperms or angiosperms?

**True or False**

5. Most of our food supply is categorized as angiosperms.

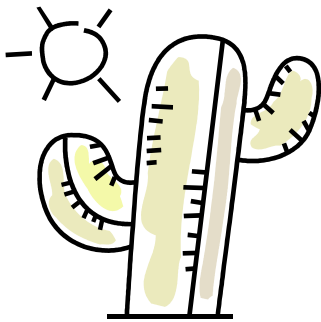
6. Male cones tend to be larger than female pine cones.

7. Plants reproduce asexually.



# 1. Lab #7: An Introduction to Plant Diversity

Animals, including ourselves, would not be here were it not for this Kingdom. Directly and indirectly, we depend on them for the majority of our food, oxygen and shelter. **What's so important about members of the Plant Kingdom?**



- About 40% of our medicines are derived from plants.
- Plants moderate climate, hold rich soil in place and help retain moisture.
- They have sheltered and provided for us as long as we have been human.
- Plants enrich the beauty of the world, have inspired and taught us.

Today, we'll take a brief look at the major groups of plants today, and at major plant characteristics. Use this study guide and work with a partner to complete this lab. Be sure to sketch as many of the specimens as you can, and answer the questions that are inside this lab. Answers can be found in the lab (handouts, posters, models, display) or from your text book's chapter on the plant kingdom.



The Plant Kingdom includes all green plants (trees, shrubs, flowers, crops, mosses, ferns, algae etc). Be aware that classification schemes differ according to authority. For example, the algae are often placed in the kingdom Protists. The outline below is just a "bare bones" sort of classification. Be able to place specimens in the correct major group, and be able to ID more specific details such as flower parts and functions.

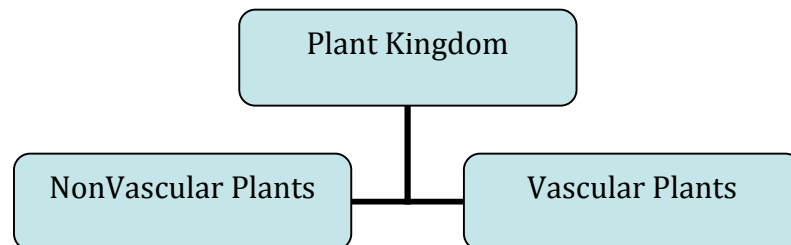


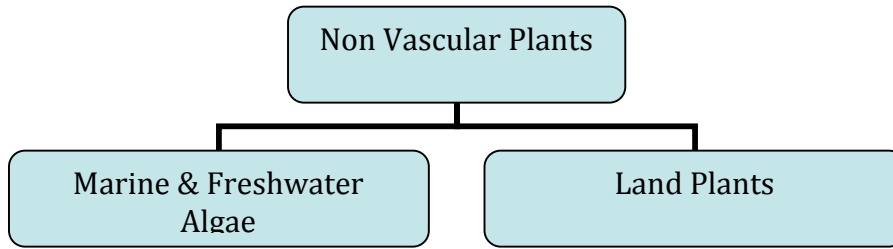
**Use your text book and any materials provided in lab to answer the following:**

What are the major characteristics of this kingdom?

Describe the major ecological roles of plants

Describe commercial, economic/medical importance to us.





Marine & Freshwater Algae	Nonvascular Land Plants
<p>Seaweeds and freshwater algae Such as spirogyra</p> <p>No tissues specialized to carry water, nutrients within the plant</p> <p>Many have stripes and blades resembling stems and leaves</p> <p>Some with hollow, gas-filled floats to keep them near the surface of the water</p> <p>Many have additional pigments which mask their chlorophyll (so they're not green in color)</p> <p>Absorb CO<sub>2</sub>, nutrients, H<sub>2</sub>O directly from the water</p>	<p>Bryophytes (mosses etc)</p> <p>Lack vascular, conductive tissues.</p> <p>Have aquatic, motile sperm</p> <p>Require water for reproduction and nutrition</p>

VASCULAR PLANTS:

- Have vascular, conductive tissues
- Xylem conducts water and dissolved minerals generally upward in plants
- Phloem conducts sugars generally downward from the canopy to the rest of the plant.

## 2 BROAD CATEGORIES OF PLANTS

### 1. NON-seed Vascular Land Plants

- Ferns
- Horsetails
- Fairly primitive groups
- Primary Growth

### 2. SEED Vascular Land Plants (mature plants produce seeds as reproductive structures)

- **Gymnosperms:** “naked seed”
  - Conifers such as pines, spruces, redwoods, firs, ginkgo etc
  - Seeds not enclosed in fleshy fruit but held in woody female reproductive structures (cones)
  - Staminate (male) cones produce pollen: wind pollinated
  - Vital contributors of timber for housing, fuel wood, habitat for many species etc.
  - Secondary Growth
- **Angiosperms:** All flowering plants
  - Biggest group of plants today. Includes all grasses, crop plants, shrubs, most trees (oaks, willows, beeches, sycamores, eucalyptus, etc)
  - Seeds enclosed in fleshy fruits
  - Flowers contain male & female reproductive structures
  - Examine models of flowers on display
  - Diagram a flower in the margin and label the following structure: stigma, style, ovary, stamen, anther, filament. Include the function of these structures as well.

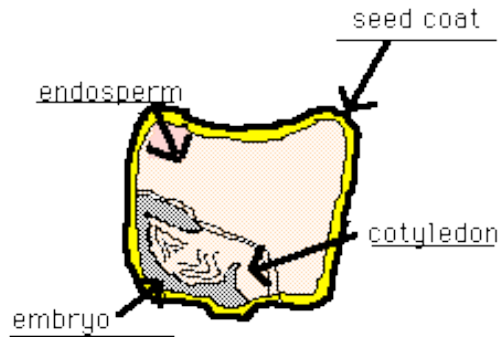


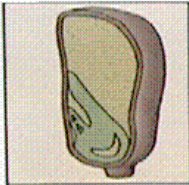


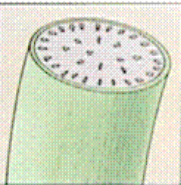
### Answer The Following:

1. What is the function of flowers?
2. What is pollination?
3. Examples of pollinators?
4. Why are most plants animal-pollinated rather than wind?

## There are 2 categories of Angiosperms:

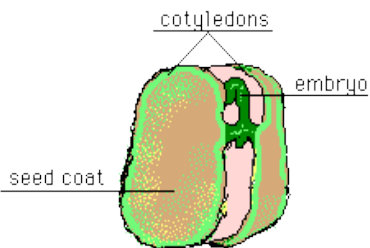
### 1. Monocots: ie: CORN

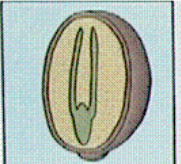
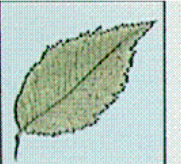
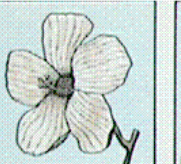
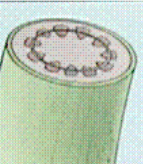


MONOCOTS			
Cotyledons	Veins in leaves	Flower parts	Arrangement of primary vascular bundles in stem
			
One cotyledon	Usually Parallel	Usually in multiples of three	Scattered

### 2. Dicots: ie: Bean Plant

2 cotyledons. The seed separates into 2 parts.



DICOTS			
Two cotyledons	Usually netlike	Usually in fours or fives	In a ring
			

**Pollination:**

Pollination systems are among the very oldest of species partnerships or symbiosis, beginning several hundred million years ago. Flowers exist not for us, but for the attraction and reward of the plants' hard working animal go between.

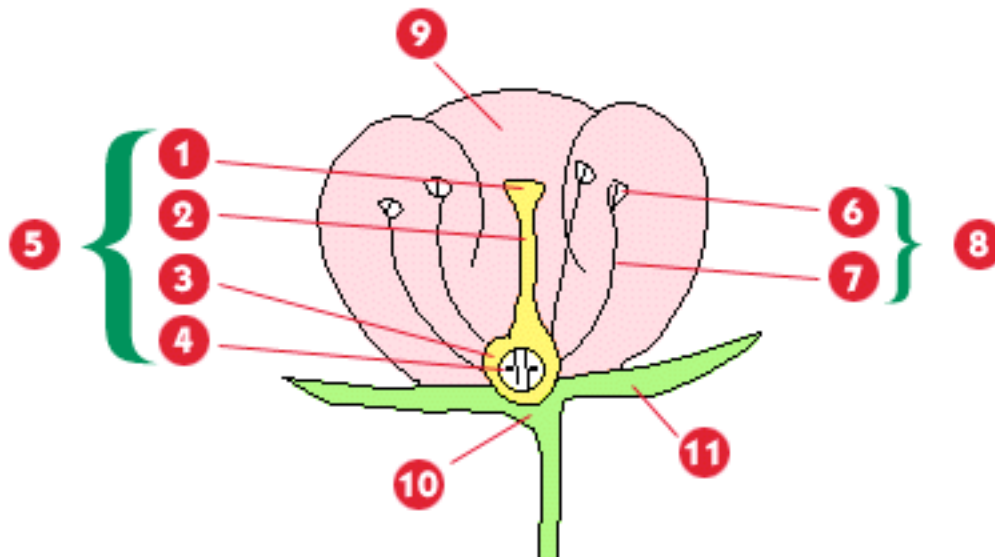
**Wind Pollination:**

Some plants, such as grasses, oaks, alders, willows etc, rely on wind to carry their pollen. It's wasteful, though, as most of the pollen doesn't make it to the next plant and it is energetically expensive to make. So, most flowering plants use more efficient carriers (animals such as insects, birds, mammals and even reptiles).

Most flowers combine male and female parts.

- The male structure, the stamen (made up of anther & filament) produces the pollen.
- The female stigma receives it, and the pollen grain sends a tube down the stigma to the ovary, where the egg is fertilized.
- In addition, plants which are animal-pollinated frequently produce rewards for the their pollinators: nectar, wax, pollen.
- Flowers are often attractive just to specific pollinators, and this specificity is determined by flower color, scent, location, reward, and time of blooming.
  - SO, flowers which attract bats bloom just at night, are light-colored, and often have heavy duty landing platforms.
  - Plants which use birds as pollinators have flowers which are most often red in color, have no scent, and which produce copious nectar as a reward.
  - Flowers which attract flies often have an aroma like that of a dead cow!

### Parts of a Typical Flower



**Petal:** used to attract insects into the flower, they may have guidelines on them and be scented

**CARPEL:** female parts of the flower: stigma, style, ovary and ovule.

**Stigma:** covered in a sticky substance that the pollen grains will adhere to

**Style:** raises the stigma away from the Ovary to decrease the likelihood of pollen contamination. It varies in length

**Ovary:** protects the ovule and once fertilization has taken place it will become the fruit.

**Ovule:** like the egg in animals and once fertilization has taken place will become the seed

**STAMEN:** male parts of the flower: filament and anther

**Filament:** the stalk of the anther

**Anther:** contain pollen sacs that release pollen to the outside of the anthers that brush against insects when they enter the flower. Insects transfer this pollen to the stigma of another flower. This fertilizes the ovule.

**Receptacle:** This is the flower's attachment to the stalk

**Flower Stalk/ Stem:** Gives support to the flower and elevates the flower for the insects.

**Sepal:** protect the flower when the flower is still developing from a bud.



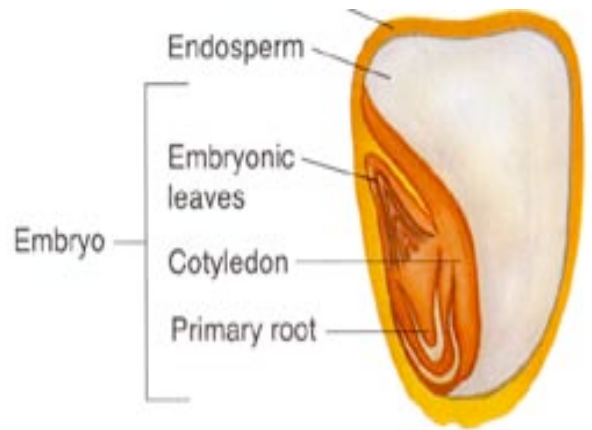
**FLOWER DISSECTION ACTIVITY:**

1. Identify all parts of a flower using a model.
2. Draw an image of this typical flower with all parts labeled.
  
3. Carefully inspect a living flower. Remove the sepals and petals by breaking them off at the base.
  - a. Are the stamens taller than the carpel?
  
4. Remove a stamen and touch the anther to a drop of water on a slide. If nothing comes off in the water, crush the anther a little to squeeze out some of its contents. Place a cover slip on the drop and observe with low and high powers of the microscope. The spherical cells with thick walls are pollen grains.
  - a. How is pollen dispersed?
  
5. Remove the carpel by cutting it free just below the base. Make a series of thin cross sections through the ovary. The ovary is hollow and in this cavity there are small, nearly spherical bodies much larger than pollen grains. These are ovules. Remove an ovule that may be still attached by a stalk to the ovary wall. Place the ovule on a drop of water on a slide. Cover with a cover slip. Press firmly on the top of the cover slip with a clean eraser so as to smear the ovule into a thin mass. Observe with the microscope. Do you see cells within the ovule?
  
6. At maturity, an angiosperm seed contains the embryo and possibly some nutrient material in the form of endosperm covered by a seed coat. A fruit is a ripened ovary.

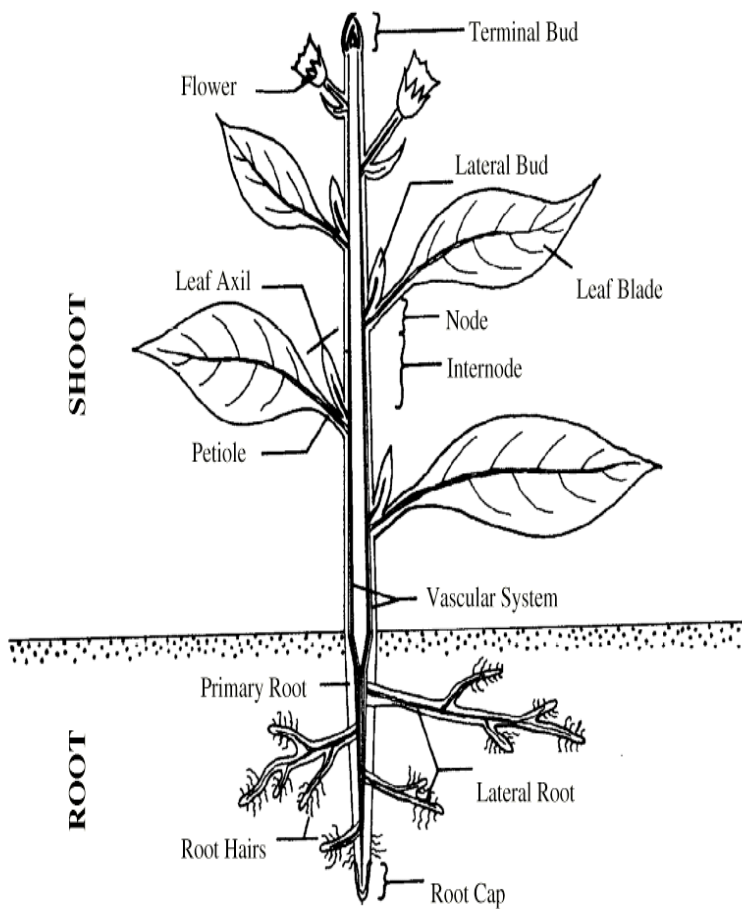
**SEEDS:**

What evolutionary advantage do seeds offer?

Using your text book or posters in lab, describe each part of the seed below.



*Principal Parts of a Vascular Plant*



**LEAVES: the photosynthetic structure of the plant.**

The leaf blade: varies greatly in shape and there are numerous terms to describe its general shape. These terms describe the leaf's

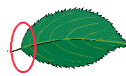
**general shape,**



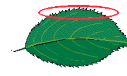
**apex,**



**base,**



**margin,**



**and veins**



The leaf blade has two types of configurations. It may be in one unit, in which case the leaf is called a simple leaf, or it may be divided into numerous small parts that look like individual leaves and which form a compound leaf.



**Leaves**

- may be arranged on the stem in a variety of ways.
- grow from a place on the stem called a node, and the part between the nodes is the internode.
- If only one leaf arises at a node the leaves are said to be **alternate**,
- if there are two leaves they are **opposite**
- and if there are more than two they are **whorled**.

The arrangement of leaves on a stem and branch is called **phyllotaxy**. There are **3 types of leaf arrangements**.

A. **Alternate:** When a single leaf arises at each node.  
(Sunflower)

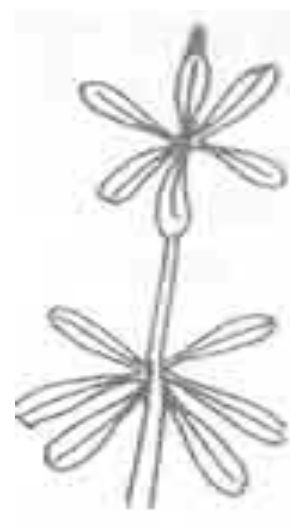


B. **Opposite:**  
opposite to

When 2 leaves arise at each node  
3ach other.



C. **Whorled:** when more than 2 leaves arise at each node in a whorl.



<h2 style="margin: 0;">Post Lab 7 Test</h2>
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1. List 4 adaptations plants had to make in order to adapt to life on land.
  
2. What is the purpose of a seed?
  
3. Members of the plant kingdom that produce seed bearing and pollen bearing cones represent what category of plants?
  
4. True or False: Most of the world's crops are angiosperms.
  
5. Is grass an angiosperm or gymnosperm?
  
6. What is the difference between a monocot and a dicot? Are these plants gymnosperms or angiosperms?
  
  
7. Define:  
 Primary Growth  
  
 Secondary Growth  
  
 Lignin
  
9. What is the name (and parts) of the male and female reproductive structures found within a flower?