

Name: \_\_\_\_\_

Date/Lab time: \_\_\_\_\_

## Lab 1: Plant Morphology: Stems

Supplies:

*Equisetum*

Dandelion

Dormant woody stem (leafless) whole and pieces.

Live woody stem

Modified stems, yam, potato, bulb, corm, rhizome (ex. ginger)

Bamboo or other stemmed monocot

*Psilotum*, ferns, horsetail, gymnosperm, etc.

Succulent stemmed plants

Young non-woody plant (bean, *coleus* etc)

Dissection Microscopes

Modified stems (see below)

Vocabulary to know: Axillary buds, Bud scale scars, Bud scales, Dichotomous branching, Nodes & Internodes, Leaf scars, Lenticels, Rosette, Terminal bud

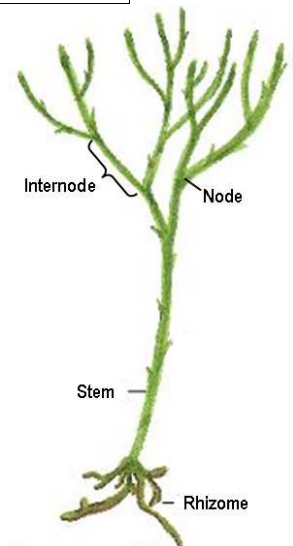
Introduction:

**Morphology** is the study of form and structure. In this lab we will examine the form and structure of stems.

Stems are one of the 3 main vegetative plant organs, the other two being roots and leaves (reproductive organs are covered in another section).

\*Stems are defined by having nodes and internodes. A node is the point of branching or leaf attachment and an internode is the region between the nodes.

Stems are the most “primitive” organ (i.e. evolutionarily earliest plant organ). Even seen in algae!



### Stems of “Primitive” Plants

#### Procedure- Observations of *Psilotum*

1. Take a look at the *Psilotum* plant provided. It lacks leaves and true roots. Photosynthesis happens in the stems while water uptake occurs within modified underground stems called **rhizomes**.

2. Note the branching pattern of *Psilotum*. Each branch point produces two identical new branches. This ancestral “primitive” branching pattern is called **dichotomous branching**.

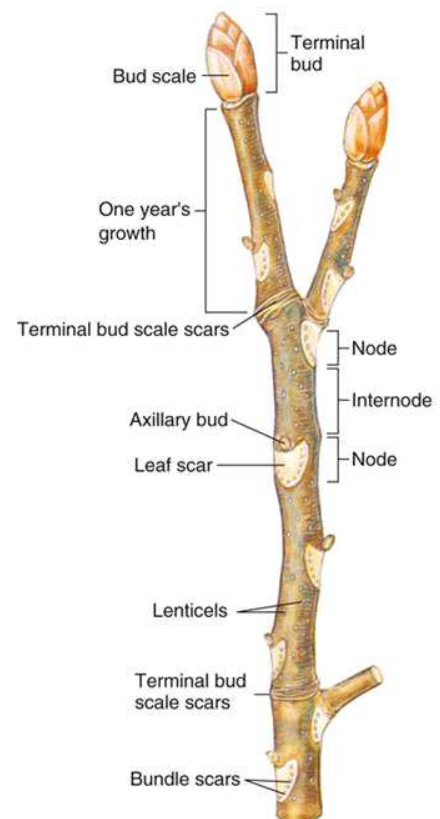
### External Form of a Dormant Woody Shoot

#### Procedure- Observation of Dormant Woody Stem

1. Note the following features on the dormant shoot available.

**Terminal bud, bud scale scars, leaf scars, nodes, internodes, axillary buds, bud scales, lenticels.**

2. The **terminal bud** occurs at the tip of the dormant shoot. Come spring this bud will grow, extending the length of the shoot. In perennial plants a terminal bud happens each spring. This forms a cluster of **terminal bud scale scars**, thus it is possible to determine the age of a shoot and its pattern of growth by observing the number of bud scale scars. The distance between bud scales indicates the length of yearly growth.



⇒ How old is the oldest part of the dormant shoot your instructor provided? \_\_\_\_\_

Some of the dormant shoots in lab are from *Ailanthus* (tree of heaven). Compare the dormant stem to the actively growing shoots (non-dormant shoots) (if your instructor has remembered to bring them in:). Note how the shoot has developed from its dormant state.

3. **Leaf scars** indicate where last years leaves abscised (fell off). Each represents a node with the region between being the internode. Examine the leaf scar from a piece of dormant stem under the dissecting microscope noting the presence of vascular bundle scars that supplied the leaf with water and conducted sugars out of the leaf.

Note the presence of an **axillary bud** above each leaf scar. These axillary buds have the potential of forming a new branch or flower in the spring. Axillary buds and the terminal bud are composed of modified "woody" leaves (**bud scales**) that protect the shoot tip over the winter.

4. Examine a region of the internode under the dissecting scope and locate a **lenticel**. Lenticels are slightly raised regions of thin walled cells that occur on the bark of woody stems and represent specialized regions for gas exchange.

#### External Form of a Herbaceous Stem

1. Herbaceous plants do not produce bark. Gas exchange occurs across their epidermis through stomata. Stomata are small openings in stems and leaves (we will examine later). Look at the stem of an herbaceous plant like *coleus* or bean (don't use the new growth of a woody plant). Does an herbaceous stem have lenticels?

⇒ Yes or No?

2. Study the living stems from other plants made available. Note some plants (like the dandelion) have reduced internodes. This form of growth is called "rosette growth".

#### Dicot Vs. Monocot stems

Throughout the labs we will be studying major differences between major groups of plant, including the two major classes of plants:

- Magnoliopsida – Dicots.
- Liliopsida- Monocots.

Monocots and Dicots differ in the anatomy and morphology of their stems, roots, leaves and reproductive structure. Understanding these differences will help you in identify these plants.

**Monocots** include plants like grains, (wheat, corn, rice, millet) lilies, daffodils, sugarcane, banana, palm, ginger, onions, bamboo, sugar, cone, palm tree, banana tree and grasses.

**Dicots** include plants like legumes (pea, beans, lentils, peanuts) daisies, mint, lettuce, tomato, oak trees, etc.

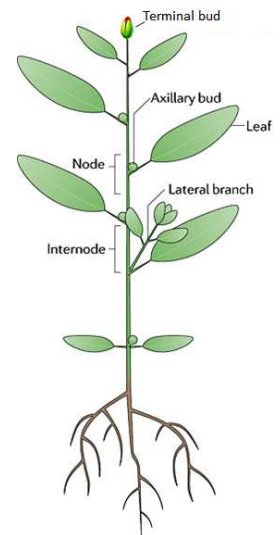
1. Are leaf scars present in Monocots? AKA can you tell where leaves were?

⇒ Yes or No?

2. Are bud scale scars present in Monocots? AKA can you tell where buds were?

⇒ Yes or No?

3. How do the external structure stems from Monocots differ from those of Dicots? Also note any stems available from Bryophytes (moss), Pterophytes (ferns, horsetail) and gymnosperms (these will be covered in more detail later). Note any characteristics as described above. (Put your observation into the Plant Forms table).



## Modified Stems

The structure of stems defines its function. Stems can hold the plant upright supporting leaves, allow for competition for light by rapid growth or climbing. Some stems are photosynthetic and some are involved with storage of materials. Some stems are involved in asexual propagation of a plant. These reproductive stems are often highly modified and often are underground.

1. Note the external features of the potato tuber. Does it have nodes and internodes? What about yams, bulbs or corms? An example of a corm is the “bulb” of gladiola.

Look for some of the following modified stems in the plants on display.

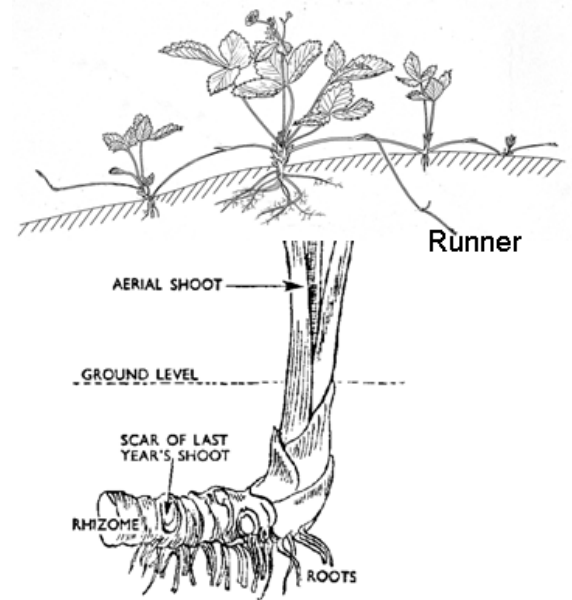
1. Above ground stems
  - A. Runners- horizontal- propagation, form new plant at node (strawberry, spider plant)
  - B. Tendrils-stem or leaf twining- climbing support (morning glory)
  - C. Trichomed- sticky- climbing (bedstraw)
  - D. Cladophylls- flattened stems- photosynthesis (xmas cactus)
  - E. Thorns- not needles, not branches- defense
  - F. Succulent- water storage, photosynthesis
2. Below ground stems (storage/propagation)
  - A. Bulbs- rosettes (mostly leaves)- storage
  - B. Corms- vertical stems- storage (crocus, gladiolus)
  - C. Tubers- storage, propagation
  - D. Rhizomes- storage, propagation (some grasses, ferns)

### Taxonomy using stems:

Differences in stem morphology can aid in plant ID. Be observant when examine plants. Stems can be round, ridged, square; they can be smooth or hairy; they can be hollow, woody or herbaceous.

### ⇒ Questions:

1. Draw a leaf scar. Where specifically are axillary buds located?
2. What is the difference between bud scale scars and leaf scars?
3. How the structure of a lenticel differ from the remainder of the stem? (lenticels will be reexamined more in the wood lab)
4. How does this difference relate to the function of lenticels?
5. How does the elongation of internodes in rosette plants, like dandelion, compare to that seen in “normal” plants?



Rhizome, underground plant stem Rhizome

