

Name _____

Pre-Lab: Plant Diversity

1) For each of the following, indicate whether it is a sporophyte or a gametophyte. See the life cycle diagrams in your lab manual for help.

- a) The antheridium of mosses.
- b) The archaegonium of mosses.
- c) The archaegonia of fern.
- d) The trunk of a tree.
- e) The wrinkly outside shell of a peanut.
- f) A pollen grain from a daisy.
- g) A pine needle.

2) Give an example of a gametophyte you can see without a microscope.

Plant Diversity I

Note: There are three focal points to your total study of plant diversity in the next two lab sessions. This week you will study the diversity of plant life cycles set up in lab and see examples in the greenhouse. Next week you will focus on Plant Growth and Plant Structure. There will be a laboratory practical exam after these two labs and everything you learn from now until then regarding plants in lab could be on it. Focus today on plant life cycles.

Purpose

To observe and analyze the diversity of plants through studying four major land plant groups.

Identify the parts of plants at different life stages.

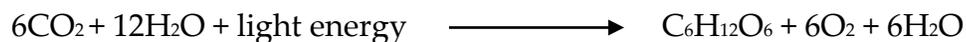
Dissect a flower (second week) Bring one in next week!

Identify structure of plants: stems, leaves, roots, xylem, phloem, etc.

Introduction

The Kingdom Plantae is characterized by multicellular, autotrophic (primarily but there are exceptions), sexually reproducing eukaryotes. Their cells have pigment-containing plastids. The main photosynthetic organelle contains chlorophyll a and b and is called a chloroplast. Plants have well defined cell walls made of cellulose. Reproduction in plants is characterized by alternation of generation which you will exam in different plant phyla. There are 10 extant phyla (see *Campbell's* Table 29.1)

Photosynthesis:

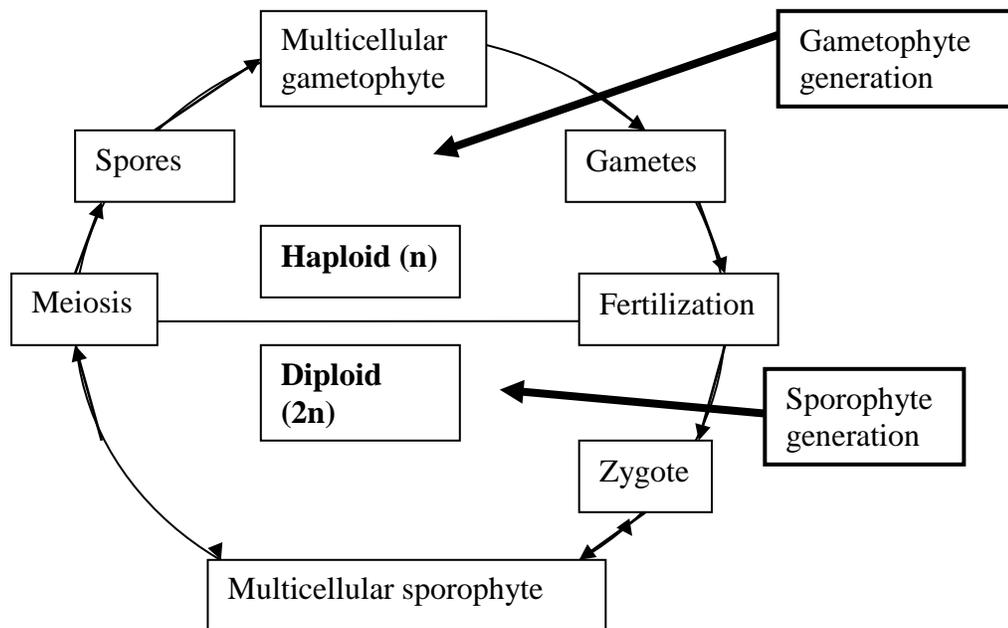


Plants are the dominant form of photosynthetic life on land. Algae, both microscopic forms and larger seaweeds, are the dominant photosynthetic life forms in fresh water and marine environments.

The best context within which to examine the plant material in this lab exercise is the increasing complexity of plants as they have become better adapted to terrestrial environments. The earliest land plants were obligated to live in moist environments. They didn't need or have water-conducting roots or vascular tissues like xylem. Modern mosses and liverworts are still like that. Reproductive strategies and structures have also changed with increasing adaptation to terrestrial environments. The gametophyte stage is less pronounced in the more evolved plant taxa. Plant embryos in these taxa are

packaged in containers that can withstand prolonged desiccation. We call these containers seeds. General characteristics of the plant groups are listed in the table below followed by a generalized life cycle diagram.

Plant	True Roots?	Dominant generation	Haploid N or Diploid 2N	Spores? N or 2N?	Seeds?	Flowers?
Moss	No	Gametophyte	Haploid -N	Yes - N	No	No
Fern	Yes	Sporophyte	Diploid -2N	Yes - N	No	No
Pine	Yes	Sporophyte	Diploid - 2N	Yes - N	Yes	No
Lily	Yes	Sporophyte	Diploid - 2N	Yes - N	Yes	Yes



All plants have life cycles that continually alternate a sporophyte generation with a gametophyte generation. The sporophyte produces spores through meiosis which germinate and grow into the gametophyte. The gametophyte produces gametes through mitosis that fuse during fertilization to form the zygote which grows into the sporophyte. All parts of the plant in the sporophyte generation are diploid and have two sets of chromosomes in each cell except for the spores. All parts of the plant in the gametophyte generation are haploid and have one set

of chromosomes in each cell. Organisms that have the alternation of generations must have multicellular individuals in both generations.

Though you will have two weeks to learn the life cycles of these land plant groups and draw diagrams of them, you are encouraged to do as much today as possible. You will also learn about the structure roots, stems and leaves and the structural differences between Monocots and Dicots. You will answer also questions in the greenhouse and perform the plant growth lab, which follows this one.

Part I: Plant Diversity Drawings: Look at the plants and microscope slides in the lab. Draw what you see, using the textbook as a guide.

Lab assignments: You must draw the 22 pictures listed below and use them to study for the lab practical. Your TA will check to make sure you have done this. Label drawings with sizes indicated on each. The table below helps to identify by plant type what should be included, indicate any features in {braces} in the table below: (macroscopic - how it looks to the naked eye; microscopic = how it looks in the microscope).

<u>Type of Plant</u>	<u>Gametophyte</u>	<u>Sporophyte</u>
Moss: Bryophyta	* <u>macro</u> Leafy green plant * <u>micro</u> slide of stem x-section with no vascular bundles	* <u>macro</u> stalk and capsule * <u>micro</u> spores in capsule (cross section of capsule with spores)
Fern: Pterophyta	* <u>micro</u> male c. fern gametophyte on plates and hermaphrodite forms	* <u>micro</u> {stem vasculature} {fronds with "sori" containing spores} * <u>macro</u> fern plant
Pine: Coniferophyta	* <u>micro</u> of both megagametophyte (in ovule) and microgametophyte (pollen)	* <u>macro</u> female cone & male cones Pine branches Stem vasculature
Angiosperm : Angiospermae	* <u>micro</u> of both megagametophyte (in ovule) and microgametophyte (pollen)	* <u>macro</u> flowering plant * <u>micro</u> leaf cross section vasculature of stem

Lab Check list of Drawings/Task

- 1) Male g'phyte c-fern_____
- 2) Hermaphrodite g'phtye c-fern_____
- 3) Sporophyte c-fern_____
- 4) Moss macro g'phyte_____
- 5) Moss micro g'phyte {no vascular bundles}_____
- 6) Moss macro s'phyte_____
- 7) Moss micro s'phtye {spores in capsule}_____
- 8) Fern micro male g'phyte_____
- 9) Fern micro hermaphrodite g'phyte_____
- 10) Fern micro s'phyte {vasculature}_____
- 11) Fern macro s'phyte {spores in sori}_____
- 12) Pine micro mega g'phyte (in ovule)_____
- 13) Pine micro micro g'phyte (pollen)_____
- 14) Pine macro female cone_____
- 15) Angio micro mega g'phyte (in ovule)_____
- 16) Angio micro micro g'phyte (pollen)_____
- 17) Angio micro leaf cross section {vasculature}_____
- 18) Dissected flower_____
- 19) Fern life cycle_____
- 20) Moss life cycle_____
- 21) Pine life cycle_____
- 22) Angiosperm life cycle_____
- 23) Brought in a flower_____

PART II. Greenhouse Tour

Diversity of Plant Adaptations

The greenhouse is on the fourth floor of the Science Building. As you enter the potting room and work area, the first glasshouse on the left is a tropical room, the second and third contains teaching and research materials. **Before visiting the greenhouse**, look over the questions below. When you get to the greenhouse, wander through all the rooms before you look for plants that will enable you to answer the questions. Some of the questions require the use of your text or other reference for their answer. The answers to these questions will be due in your next lab.

1. Leaves are not the only photosynthetic organs of plants. What other kind of photosynthetic structure have you seen in a greenhouse plant? Give two examples with genus and species names.

2. What plants in the greenhouse do you find that are specialized for defense against herbivores and what adaptations do they exhibit? Give two different examples with genus and species names.

3. All plants require mineral nutrients (nitrogen, phosphorus, potassium, etc.). Terrestrial and epiphytic plants obtain these in different ways. How do these plants differ in the way they get their nutrients? Give examples of each type found in the greenhouse.

4. Give two examples, with genus and species names, of plants found in the greenhouse that you might also find in the supermarket in one form or another.

5. In the greenhouses, there are several plants which are part of the *Lamiaceae* or mint family. Surprisingly, these all look and smell very different. What can you observe that is the same in all these plants?

6. The middle greenhouse contains samples of psilotum and selaginella. What phyla of plants do these represent? You may need to look these up in *Campbell*.

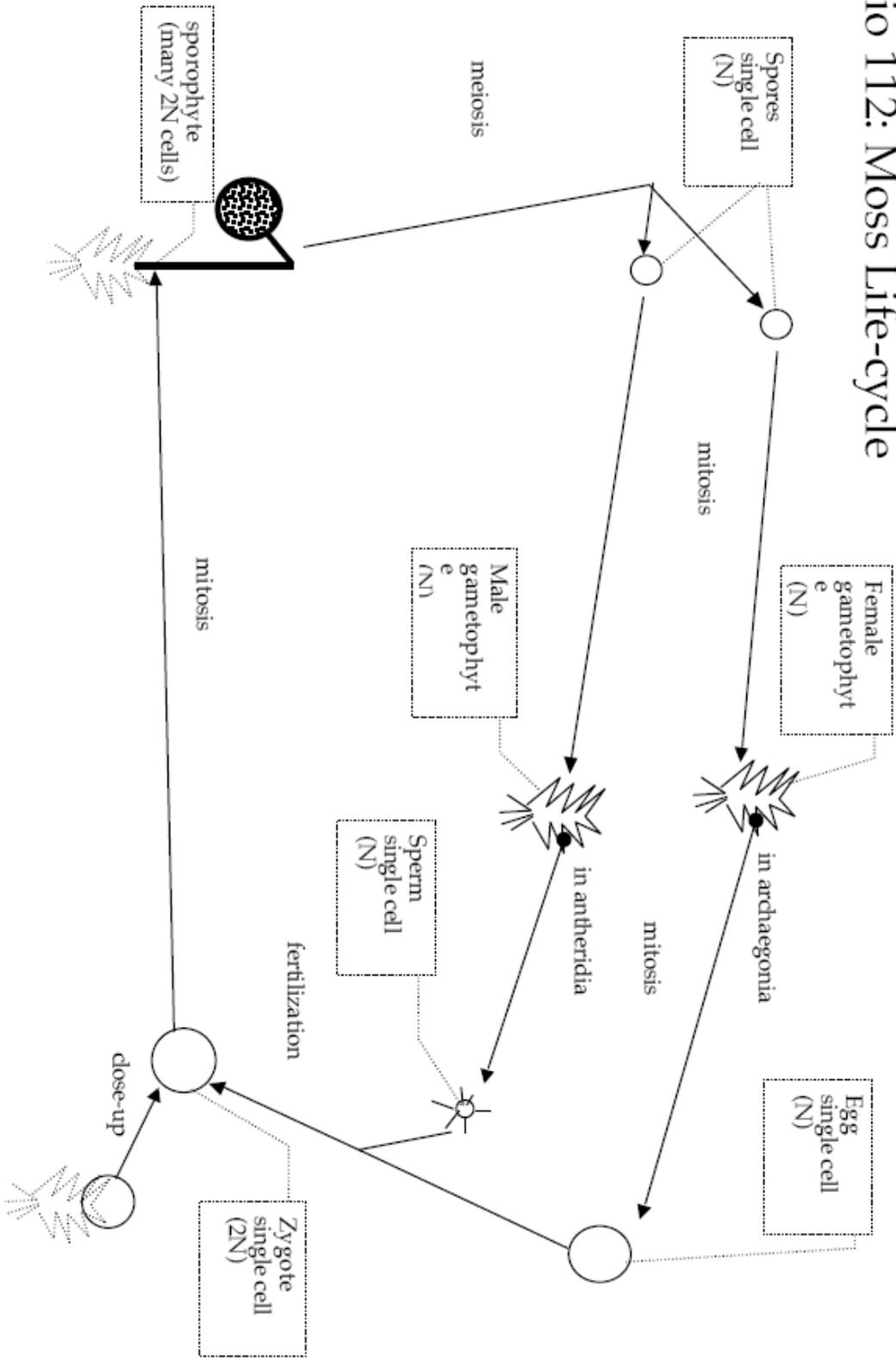
7. In the greenhouse, you will find the following plants:

sea onion oleander sweet potato shell ginger

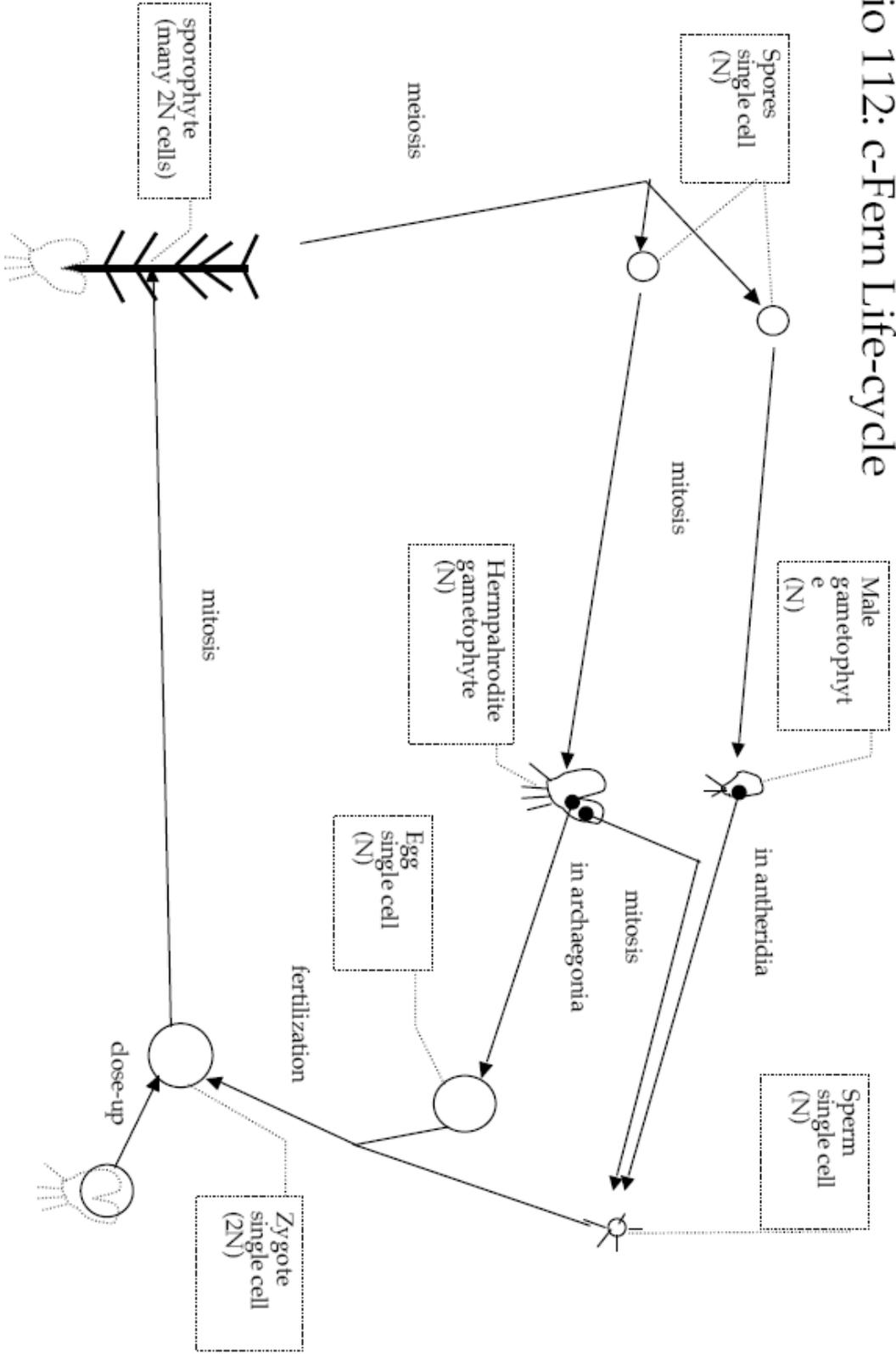
Based on the leaf vein morphology, which of these are monocots and which are dicots?

8. In the greenhouse are several succulent plants. What do they have in common? Is this an example of convergent evolution? Why/why not? How are these advantageous in dry climates?

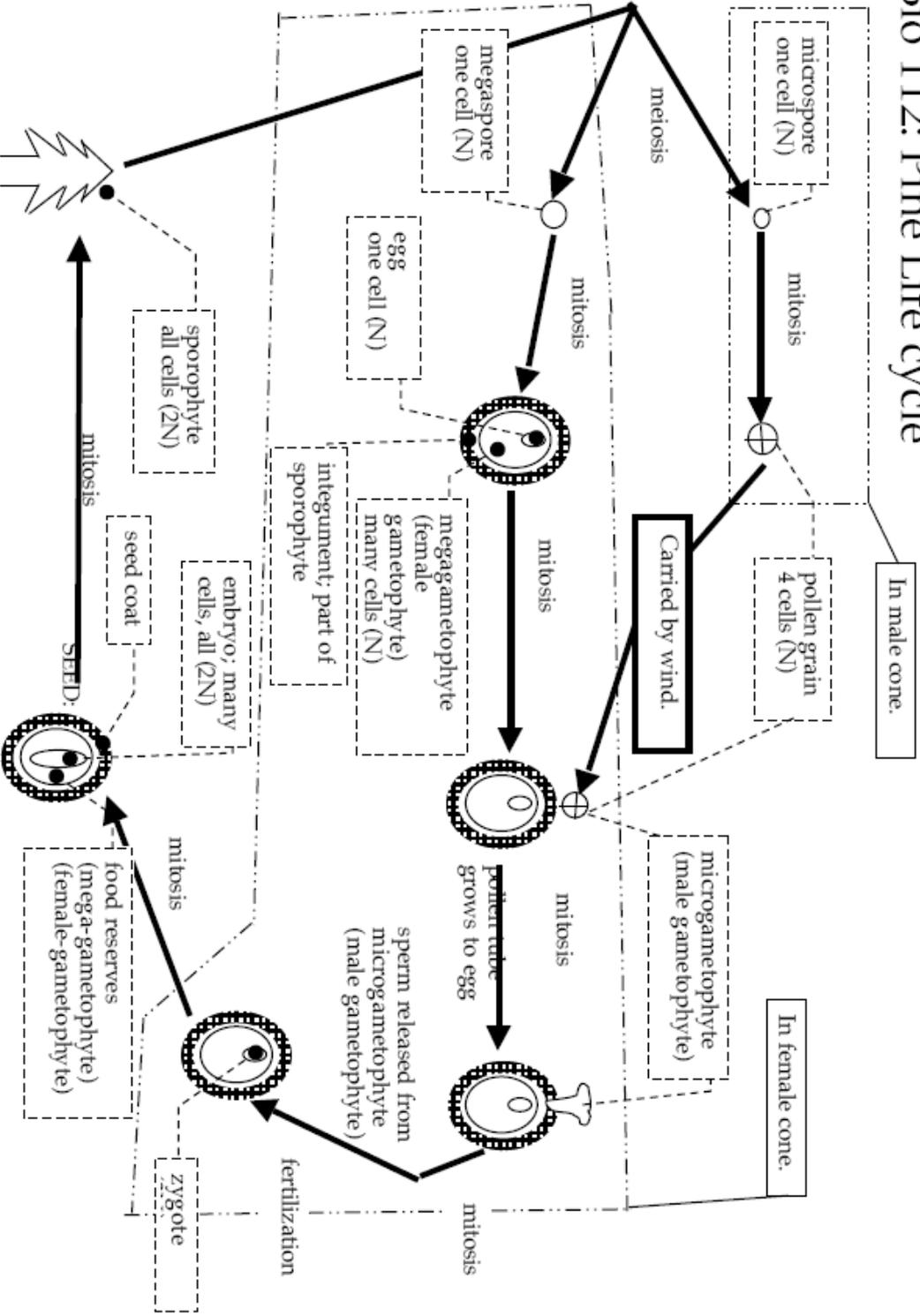
Bio 112: Moss Life-cycle



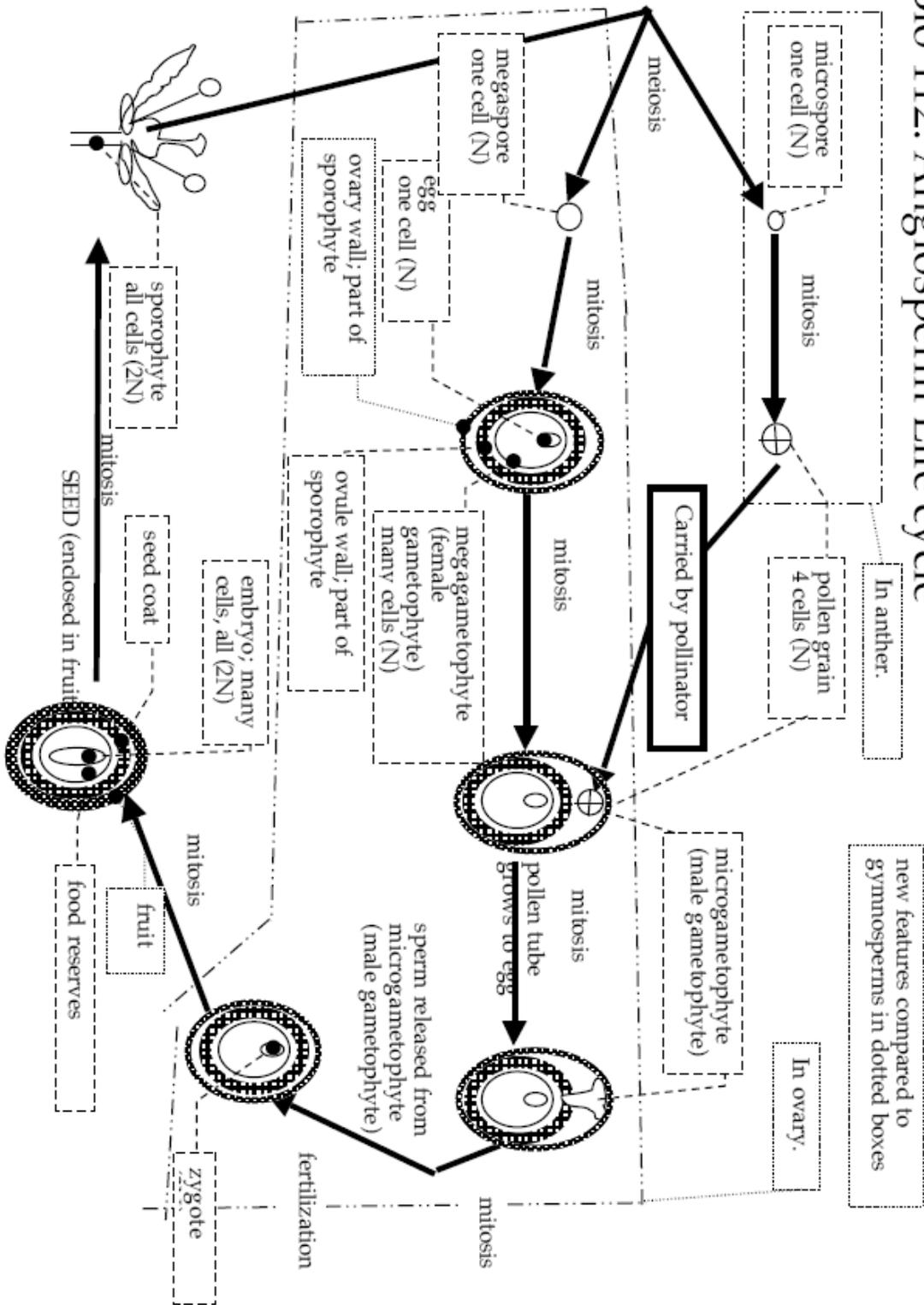
Bio 112: c-Fern Life-cycle



Bio 112: Pine Life cycle



Bio 112: Angiosperm Life cycle



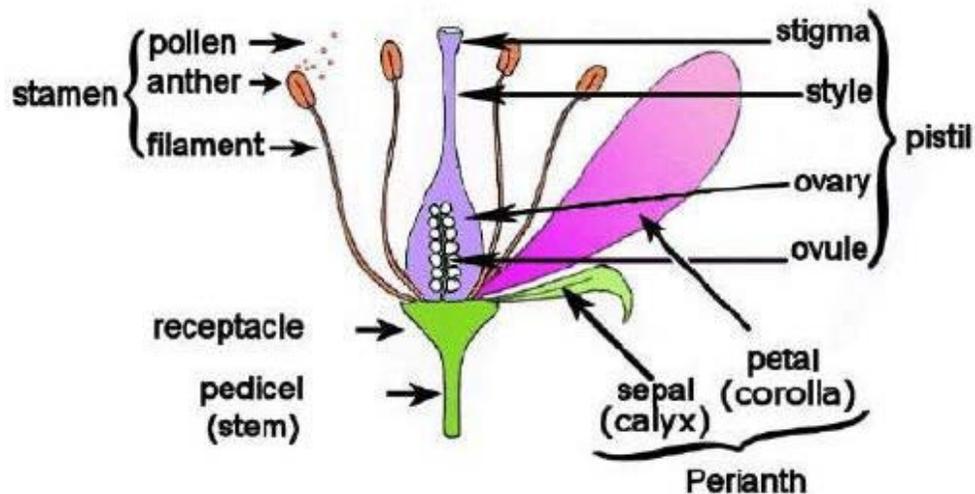
Part III Angiosperm Diversity and Structure: Monocot vs. Eudicots (Dicots)

A. There are two major divisions in the Angiosperma- the Monocots (e.g. Corn, grasses, Palm trees) and the Eudicots (Roses, Oak trees, Maple trees).

Compare and draw the following structures of plants from each group; use your atlas for additional pictures and diagrams:

1. Number of cotyledons (embryonic leaves)
2. Leaf venation
3. Stem vascular tissue (How are the xylem and phloem arranged?)
4. Root structure and cross section
5. Numbers of flower organs.

B. **Flower anatomy:** Exam the flower you brought it. Before you cut it count the flower parts. Is a monocot or a eudicot? Include the name of the plant and the size of the flower. You must draw and label your dissected flower as well as diagrams of the lily anthers and stamen from prepared slides.



1. Flower Dissection

Cut your flower down the center into the stem with the scalpel to open it up. Make a drawing of your flower. Label all of the parts you can identify using your text as a guide. Label the following parts: Carpel (Stigma, Style, Ovary); Stamen (Anther, Filament); Sepal, Petal, Ovule. NOTE: Not all flowers have all of the parts listed, if the flower you brought in lacks some of these parts, look at more flowers. Why might some individual flowers lack some of these parts?