

## Biology 154 Practical Exam 1, March 1999

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### Question 1/ Station 1

Observe the organisms in the slides of microscopes A and B

- A. To what kingdom they belong ? (1 pt)
- B. Based on the color of the stain AND their body shape, specify the type of the organisms you see in:  
 microscope A – (1 pt)  
 microscope B – (1 pt)
- C. What is the advantage to the organism *Penicillium* to synthesize the antibiotic penicillin? (4 pts)
- D. Which type of bacteria is Penicillin especially effective against ? (3 pts)

### Question 2/ Station 2

Examine the images in each of the microscopes and fill in the table below:

Microscope	name (1pt)	Kingdom (1 pt)	Photosynthetic? (0.5 pts)
A			Yes or No
B			Yes or No
C			Yes or No
D			Yes or No

### Question 3/ Station 3

Examine the figure in front of you (taken from a popular non-majors biology textbook) that depicts the evolutionary origin of the eukaryotes and “higher” kingdoms of life.

- A. What is the name of the theory shown in this figure? (2 pts)
- B. Briefly list AND explain the evidence in support of this theory. (5 pts)
- C. Look very closely at the part of the diagram from which the various eukaryotic Kingdoms arise. What is wrong with this figure? (3 pts)

### Question 4/ Station 4

- A. Name the life form on top of the rock (2 pts)
- B. What organism(s) is it made of ? (2 pts)
- C. To which kingdom(s) do they belong (2 pts)
- D. This organism is an excellent bio-indicator of pollution. What type of environmental pollution is best assessed using this organism. Please provide a brief explanation. (4 pts)

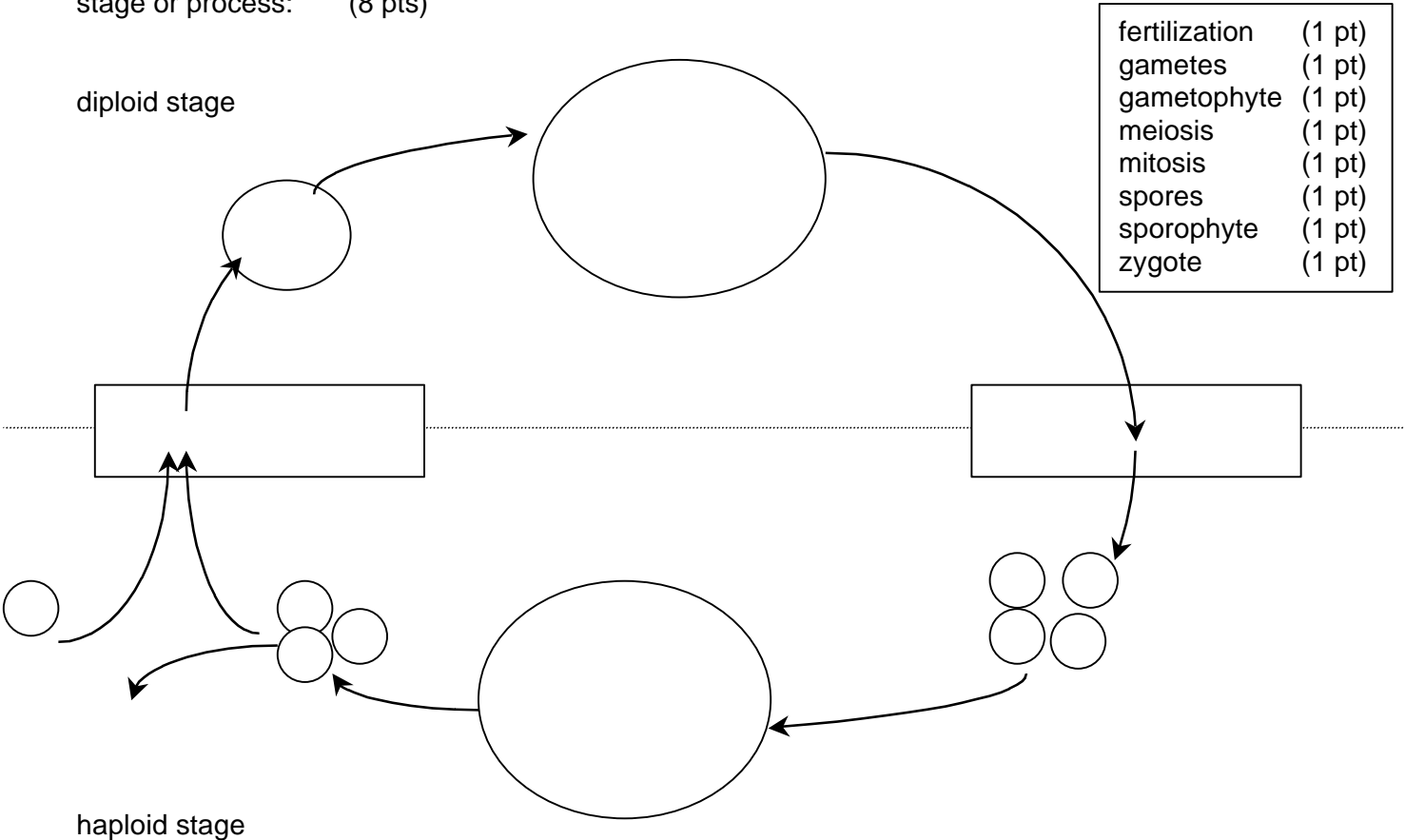
Question 5/ Station 5

A major characteristic of plants is the "alternation of generations" during plant life cycles.

A. What exactly alternates?

(2 pts)

B. Please complete AND clearly document the schematic figure below showing the generalized life cycle for a plant. Include in your figure the terms in the box at right to label either the appropriate life stage or process: (8 pts)



Question 6/ Station 6

Examine the three plants in front of you – a moss, a fern, and a whisk fern

A. which is which?

(2 pts)

plant #1 - (green leaves  
plant #1 - (tan stalks)  
plant #2 -  
plant #3 -

B. which generation are you looking at (sporophyte or gametophyte) and what is the ploidy (haploid or diploid)? Circle your choices for each plant. (6 pts)

plant #1 (green leaves)	sporophyte or gametophyte	AND	haploid or diploid ?
plant #1 (tan stalks)	sporophyte or gametophyte	AND	haploid or diploid ?
plant #2	sporophyte or gametophyte	AND	haploid or diploid ?
plant #3	sporophyte or gametophyte	AND	haploid or diploid ?

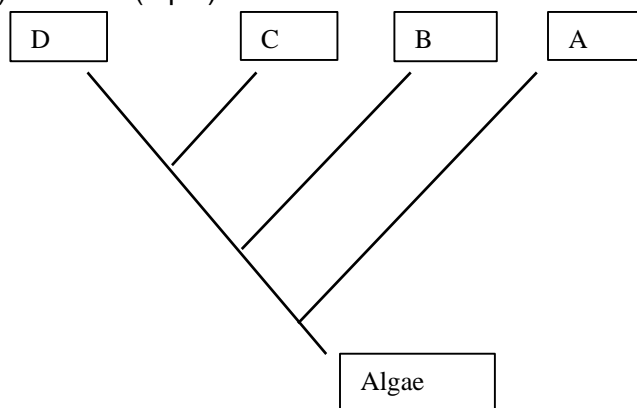
C. place them on the phylogenetic tree (circle the letter) (2 pts)

plant #1 (green leaves) A B C D (1 pts)

plant #1 (tan stalks) A B C D (1 pts)

plant #2 A B C D (1 pts)

plant #3 A B C D (1 pts)



Question 7/ Station 7

Put a check mark ✓ in the correct column 2 pts each

	Root	Stem	Leaf
microscope A			
microscope B			
microscope C			

Put a check mark ✓ in the correct column 1 pts each

	Monocot	Dicot
microscope A		
microscope B		
microscope C		

Question 8/ Station 8

Figures 1, 2, and 3 show 3 different divisions of fungi

A. Name them

Figure 1. - (1 pt)

Figure 2. - (1 pt)

Figure 3. - (1 pt)

B. State the basic characteristic(s) upon which the classification of these fungi into the different divisions is based. (4 pts)

C. List 3 major characteristics that are found in ALL fungi (i.e. these are the distinguishing characteristics of the Fungi).

1. (1 pt)

2. (1 pt)

3. (1 pt)

Question 9/ Station 9

The 3 figures at this station plot the results of the computer simulation of the effects of light (figure 1), relative humidity (figure 2), and temperature (figure 3) on the photosynthetic rates of plants.

A. Name the type of response you see for each of this factors

light - (1 pt)

RH - (1 pt)

temperature - (1 pt)

B. Explain why you get the specific kind of response to each of these environmental factors

light (1 pt)

RH (3 pts)

temperature (3 pts)

## Question 10/ Station 10

This stomata picture was scanned from a recent issue of Science (a major scientific journal) that discussed options for bioengineering agricultural crops to optimize production. If you were working on this project...

- A. ...what design features of stomata would you try to "engineer" in a dry-land crop where water is scarce (such as corn in Texas)? Please briefly explain your answer. (5 pts)
- B. ...what design features of stomata would you try to "engineer" in a wet-land crop (such as rice in Louisiana)? Please briefly explain your answer. (5 pts)

## Question 11/ Station 11

- A. State in one sentence what is the function of the "t-test," that is, exactly what is it used to do? (5 pts)

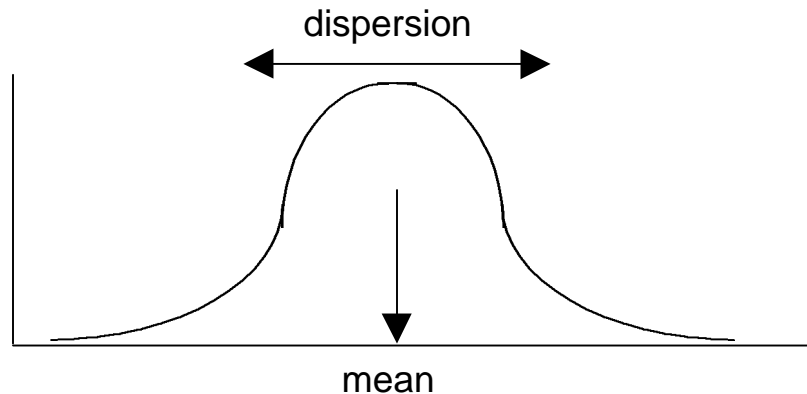
- B. The equation for the t-test (assuming unequal variances) is:

$$t = \frac{\overline{X_A} - \overline{X_B}}{\sqrt{\frac{\text{StDev}_A^2}{n_A} + \frac{\text{StDev}_B^2}{n_B}}}$$

Please explain IN WORDS without using any symbols or notation how this is a measure of the ratio of "signal" to "noise". (feel free to consult figure 1 if needed).

(5 pts)

figure 1



$$\text{MEAN} = \overline{X} = \sum_{i=1}^n \frac{x_i}{n} = (x_1 + x_2 + x_3 + x_4 + \dots + x_N) / n$$

**VARIANCE.** The variance is the sum of each of the differences or deviations between individual values and the mean value. The total difference is divided by the number of individuals in the sample minus one.

$$\text{VARIANCE: } \sigma^2 = \sum_{i=1}^n \frac{(X_i - \overline{X})^2}{n - 1} = \sum_{i=1}^n \frac{(X_i^2 - n * \overline{X}^2)}{n - 1}$$

**STANDARD DEVIATION.** The standard deviation is the square root of the variance.

## Question 12/ Station 12

These data are of stomata density (stomata/ mm<sup>2</sup>) of leaves taken from two different locations in the same bush.

- A. Is there a significant difference in stomata density between leaves taken from outside versus leaves taken from the inside of this bush?

(2 pts)

**YES or NO**

- B. Please use the appropriate information in the table to justify your answer.

(4 pts)

- C. Why is the t stat negative, and is this a concern?

(4 pts)

## Question 13/ Station 13

In front of you are two branches labeled A and B. These belong to two different groups of plants. Please describe 5 major differences between these two groups.

1. (2 pts)
2. (2 pts)
3. (2 pts)
4. (2 pts)
5. (2 pts)

## Question 14/ Station 14

Figure 1 shows a flowering Alstromaria. What are the names of ...

(4 pts)

**A** \_\_\_\_\_**B** \_\_\_\_\_**C** \_\_\_\_\_**D** \_\_\_\_\_

Figure 2 and 3 show a “rock nettle” and a “daisy,” respectively. What is the main difference in floral design in these two figures? (please ignore minor differences)

(3 pts)

What are the key advantages of animal pollination over wind pollination?

(3 pts)

## Question 15/ Station 15

- A. List and briefly explain three different ways that a plant might limit the number of different species of visitors to its flowers for pollination.

(6 pts)

1 -

2 -

3 -

- B. Why might it be to the plant's advantage to limit the number of different species of visitors to its flowers for pollination?

(4 pts)

## Question 16/ Station 16 –

In front of you are examples of some of the extreme strategies of how to disperse one's progeny away from oneself (peppers, tomato, beans, coconut, and a milkweed).

Please list the advantages and disadvantages **TO THE PLANT** of having one's progeny dispersed by wind relative to having them be dispersed by an animal using a fruit?

**ADVANTAGES TO THE PLANT** of wind/ water dispersal relative to animal dispersal –

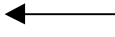
**DISADVANTAGES TO THE PLANT** of wind/ water dispersal relative to animal dispersal -

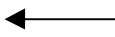
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### Question 1/ Station 1

Microscope A shows a cross section at 40X of ...?

dicot or monocot ?  (circle one) (2 pts)

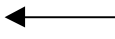
stem or root ?  (circle one) (2 pts)

Briefly explain exactly what you see in the slide that enables you to tell? (3 pts)

Microscope B shows a cross section at 400X of the central region of the same plant as in Microscope A (also see figure below). Label on the figure exactly where the xylem and phloem are located in this image. (3 pts)

### Question 2/ Station 2

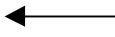
Microscope A shows a cross section at 40X of ...?

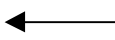
dicot or monocot ?  (circle one) (1.5 pts)

stem or root ?  (circle one) (1.5 pts)

Briefly explain exactly what you see in the slide that enables you to tell? (2 pts)

Microscope B shows a cross section at 40X of ...?

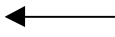
dicot or monocot ?  (circle one) (1.5 pts)

stem or root ?  (circle one) (1.5 pts)

Briefly explain exactly what you see in the slide that enables you to tell? (2 pts)

### Question 3/ Station 3

Microscope A shows a cross section at 40X of ...?

dicot or monocot ?  (circle one) (2 pts)

stem or root ?  (circle one) (2 pts)

Briefly explain exactly what you see in the slide that enables you to tell? (2 pts)

Microscope B shows a cross section at 40x of a *Tilia* stem (a woody dicot).

How old was this specimen when the cross section was made? (circle one)

- in its first year (2 pts)
- in its second year
- in its third year
- in its fourth year
- greater than five years

Is this specimen younger or older than the specimen in Microscope A? (circle) (2 pts)

### Question 4/ Station 4

The microscope shows a cross section at 100X of a dicot leaf oriented as in the figure at right.

Indicate which is the upper surface of the leaf. (3 pts)

Why are sun leaves generally thicker than shade leaves? (3 pts)

Please explain some of the major differences between monocots and dicots. (4 pts)

### Question 5/ Station 5

The microscope shows a slide of the parasite *Trypanosoma* in blood as in the figure at left.

Which arrow points to the *Trypanosoma* ? (circle) arrow A arrow B (2 pts)

Which arrow points to the Red Blood Cells? (circle) arrow A arrow B (2 pts)

What is the name of the organism in the figure at right, and to which Kingdom does it belong?  
name: (3 pts)

Kingdom:

Please briefly describe the major distinguishing characteristics of the organisms in this Kingdom. (5 pts)

## Question 6/ Station 6

Microscope A shows a colonial filamentous photosynthetic organism.

To what Kingdom does it belong? \_\_\_\_\_ (2 pts)

Microscope B shows a different colonial filamentous photosynthetic organism.

To what Kingdom does it belong? \_\_\_\_\_ (2 pts)

Also, in front of you is a herbarium sheet of another colonial photosynthetic organism.

To what Kingdom does it belong? \_\_\_\_\_ (2 pts)

Please briefly describe the major distinguishing characteristics of the organisms in the Kingdoms to which you attributed them. How are organisms in these Kingdoms similar and how do they differ? (4 pts)

## Question 7/ Station 7

This question will assess your understanding of the organism in the finger bowl.

What is its common name ? \_\_\_\_\_ (1.5 pts)

To what Division of plants does it belong? \_\_\_\_\_ (1.5 pts)

What is the ploidy of what you see in the bowl? haploid or diploid ? (2 pts)

Briefly sketch out and explain the life cycle of this organism. Please include the use of the terms sporophyte, gametophyte, archegonia (female), antheridia (male), egg, sperm, zygote, sporangium, spores, and meiosis. Also, indicate the ploidy of each stage as you illustrate the alternation of ploidy among "generations" in the life cycle. (5 pts)

## Question 8/ Station 8

A. Examine the bacteria in scope A. (2 pts)

Are these rods, cocci, or spirochetes? (circle one of these 3)

Are these gram positive or gram negative? (circle one of these 2)

B. Examine the bacteria in scope B. (2 pts)

Are these rods, cocci, or spirochetes? (circle one of these 3)

Are these gram positive or gram negative? (circle one of these 2)

C. Exactly what characteristic makes a bacterial cell "gram positive" or "gram negative"? Please briefly explain the details of why this test result occurs. (6 pts)

## Question 9/ Station 9

In front of you are several representative fungi and a lichen. For each specimen indicate (1) the class as either Zygomycetes, Ascomycetes, or Basidiomycetes, (please refer to the life cycles posted for hints), and (2) indicate the ploidy of the majority of the visible life form as either haploid, diploid, or dikaryotic.

A. yeast: (1) Class: \_\_\_\_\_ (0.5 pt)

(2) ploidy: \_\_\_\_\_ (0.5 pt)

B. shelf fungus (1) Class: \_\_\_\_\_ (0.5 pt)

(2) ploidy: \_\_\_\_\_ (0.5 pt)

C. bread mold: (1) Class: \_\_\_\_\_ (0.5 pt)

(the white filaments)

(2) ploidy: \_\_\_\_\_ (0.5 pt)

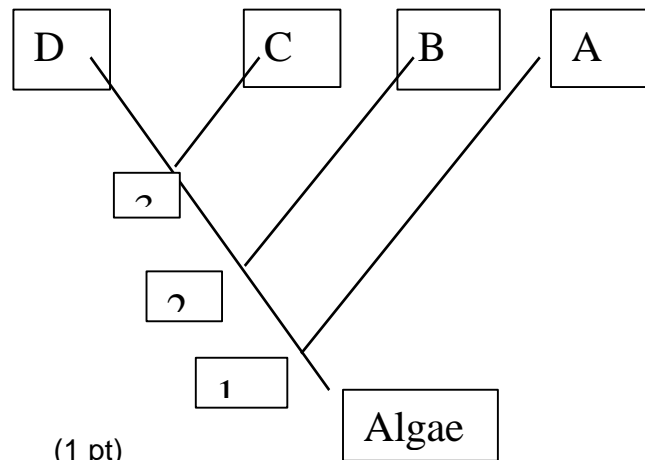
Also, in front of you is a lichen covered rock (specimen D).

Exactly, what is a lichen? (3 pts)

State and briefly explain the specific kind of evolutionary relationship demonstrated by lichens? (4 pts)

## Question 10/ Station 10

A right is a schematic of a phylogenetic tree of land plants.



Fill in the name of the group of plants that correspond to each branch.

- A. \_\_\_\_\_ (1 pt)  
 B. \_\_\_\_\_ (1 pt)  
 C. \_\_\_\_\_ (1 pt)  
 D. \_\_\_\_\_ (1 pt)

Please provide a brief description of major evolutionary “innovations” that occurred at each of the 3 major branching points

1. \_\_\_\_\_ (2 pts)
2. \_\_\_\_\_ (2 pts)
3. \_\_\_\_\_ (2 pts)

## Question 11/ Station 11

In front of you is an analysis of stomata data from your class, including a graph and the output of a t-test table.

According to this analysis, is there a significant difference between the density of stomata in the sun versus the shade?

Yes or No ? (3 pts)

Explain exactly what information on this printout gives you the answer to the above question? (3 pts)

How confident are you about this conclusion? Please use specific numbers on the t-test printout to justify your response. (4 pts)

## Question 12/ Station 12

In front of you is a potted plant and a branch from another plant. These belong to two different groups of plants. Please describe 5 major differences between these two groups.

1. \_\_\_\_\_ (2 pts)
2. \_\_\_\_\_ (2 pts)
3. \_\_\_\_\_ (2 pts)
4. \_\_\_\_\_ (2 pts)
5. \_\_\_\_\_ (2 pts)

## Question 13/ Station 13

Angiosperm flowers exhibit a process known as “double fertilization.” Sketch AND explain this process using the appropriate terminology (feel free to use the figure in front of you).

Especially explain exactly what happens that justifies its being called “double”?

(10 pts)



## Question 15/ Station 15

In front of you is an array of 6 flowers in flasks or pots. For each plant, indicate if it is a monocot or dicot, and indicate how many open flowers are present in each flask or pot by writing the number (1, 2, 3, 4 or 5) or by writing "many" if there are > 5 flowers.

plant A: monocot or dicot ? how many open flowers?

plant B: monocot or dicot ? how many open flowers ?

plant C: monocot or dicot ? how many open flowers?

plant D: monocot or dicot ? how many open flowers?

plant E: monocot or dicot ? how many open flowers?

plant F: monocot or dicot ? how many open flowers?

## Question 14/ Station 14

Label the flower parts indicated in the diagram:

A. \_\_\_\_\_ (1 pt)

B. \_\_\_\_\_ (1 pt)

C. \_\_\_\_\_ (1 pt)

D. \_\_\_\_\_ (1 pt)

E. \_\_\_\_\_ (1 pt)

F. \_\_\_\_\_ (1 pt)

G. \_\_\_\_\_ (1 pt)

H. \_\_\_\_\_ (1 pt)

I. \_\_\_\_\_ (1 pt)

J. \_\_\_\_\_ (1 pt)

## Question 16/ No Station – just answer it wherever you are.

What is the one really good question that you were prepared to answer that we did not ask you? And, what is the answer to that question? [please answer STATION 1 after you have completed the entire practical, and the answer - "you asked all the good questions" is not acceptable.]

the question we didn't ask-

(4 pts)

its answer -

(6 pts)

## Biology 154 Practical Exam 1, March 1997

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### Station 1.

What is the one really good question that you were prepared to answer that we did not ask you? And, what is the answer to that question? [please answer STATION 1 after you have completed the entire practical, and the answer - "you asked all the good questions" is not acceptable.]  
 the question we didn't ask- (4 pts)  
 its answer - (6 pts)

### Station 2.

- A. Examine the bacteria in scope A. (2 pts)  
 Are these rods, cocci, or spirochetes? (circle one of these 3)  
 Are these gram positive or gram negative? (circle one of these 2)
- B. Examine the bacteria in scope B. (2 pts)  
 Are these rods, cocci, or spirochetes? (circle one of these 3)  
 Are these gram positive or gram negative? (circle one of these 2)
- C. Exactly what characteristic makes a bacterial cell "gram positive" or "gram negative"? Please briefly explain the details of why this test result occurs. (6 pts)

### Station 3. At this station are two colonies of photosynthetic organisms from two different Kingdoms.

- A. What Kingdom is in view under the microscope? [hint: note that the label says "Oscillatoria"] (2 pts)
- B. What Kingdom is on the herbarium sheet? (2 pts)
- C. Please list three major differences of these two Kingdoms. Please be specific. (6 pts)  
 difference 1 - difference 2 - difference 3 -

### Station 4. Examine the plant in front of you.

- A. What is the common name of its Phylum? (2 pts)
- B. Which is the dominant generation in this group of plants - the sporophyte or gametophyte? [hint: which generation is in front of you?] (2 pts)
- C. What exactly alternates as these plants live out their life cycles in a process called the "alternation of generations"? [hint: think about the key genetic difference between the sporophyte and the gametophyte.] (4 pts)
- D. Which structure retains the female gametophyte in this phylum - the archegonia or the antheridia? [hint: see the slide if necessary and note that the archegonia is on the left] (2 pts)

### Station 5. In front of you is a lichen covered rock.

- A. What is a lichen? (4 pts)
- B. State and briefly explain the specific kind of evolutionary relationship demonstrated by lichens? (6 pts)

### Station 6. Examine the three species of plants in front of you - a fern, moss, and club moss.

- A. Which two are more closely related taxonomically? (2 pts)
- B. List and briefly explain two key characters that the two closely related species have in common that are NOT found in the third less related species. (8 pts)  
 character 1 unique to your selected pair -  
 character 2 unique to your selected pair -

Station 7. In front of you are two branches from two species of plants.

- A. What are the major characteristics these species share in common **and that distinguish both plants from** their more "primitive" immediate ancestor? (5 pts)
- B. What major characteristics distinguish these taxa of plants from each other? (5 pts)

Station 8. In front of you are a pine cone and a tulip flower, each of which is designed for gamete production and fertilization.

- A. To what major taxonomic group (sub-kingdom or phylum) does each belong? (2 pts)  
 pine :                      tulip :
- B. How are male gametophytes dispersed in each of these plants? (2 pts)  
 pine :                      tulip :
- C. List and very briefly explain three other major differences in sexual reproduction between pine cones and tulip flowers.  
 1 -                      2 -                      3 -

Station 9. In front of you are two microscopes showing the cross sections at 40X of **stems** of two different flowering plants.

- A. Which is the dicot and which is the monocot? (4 pts)  
 microscope A:                      dicot                      or                      monocot ?  
 microscope B:                      dicot                      or                      monocot ?
- B. List the key differences between dicots and monocots that are visible in their **stems** under 40X. (6 pts)

Station 10. In front of you are two microscopes showing the cross sections at 40X of **roots** of two different flowering plants.

- A. Which is the dicot and which is the monocot? (4 pts)  
 microscope A:                      dicot                      or                      monocot ?  
 microscope B:                      dicot                      or                      monocot ?
- B. List the key differences between dicots and monocots visible in their **roots** (at 40X). (6 pts)

Station 11. Examine the tulip flower in "flask B", and its sketch.

- A. From the sketch name the structure labeled "A":
- B. From the sketch name the structure labeled "B":
- C. From the sketch name the structure labeled "C":
- D. From the sketch name the structure labeled "D":
- E. What is the name of the olive powder coating the structure labeled "D"?
- F. In front of you is an array of 6 flowers in flasks or pots. For each plant, indicate if it is a monocot or dicot, and indicate how many open flowers are present in each flask or pot by writing the number (1, 2, 3, 4 or 5) or by writing "many" if there are > 5 flowers.  
 plant A: monocot or dicot ?                      how many open flowers?  
 plant B: monocot or dicot ?                      how many open flowers ?  
 plant C: monocot or dicot ?                      how many open flowers?  
 plant D: monocot or dicot ?                      how many open flowers?  
 plant E: monocot or dicot ?                      how many open flowers?  
 plant F: monocot or dicot ?                      how many open flowers?

Station 12. Angiosperm flowers exhibit a process known as “double fertilization.” What happens exactly that justifies its being called “double”? Please use a sketch in your explanation. [hint: how many nuclei are in each pollen grain and where do they go?] (10 pts)

Station 13. In front of you is an analysis of stomate data from your class, including a graph and the output of a t-test table.

- A. According to this analysis, is there a significant difference between the density of stomates in the sun versus the shade? (3 pts) Yes or No ?
- B. Explain exactly what information on this printout gives you the answer to the above question? ? (3 pts)
- C. How confident are you about this conclusion, i.e. if you concluded that there IS a significant difference, what are the chances that you are wrong? (4 pts)

Station 14. In front of you are several representative fungi (shelf fungus, yeast and the bread mold). For each (1) indicate the class as either Zygomycetes, Ascomycetes, or Basidiomycetes, (please refer to the life cycles for the first 3 taped to the table for hints), and (2) indicate the ploidy of the dominant (visible) life form as either haploid, diploid, or dikaryotic.

- A. shelf fungus: (1) Class: \_\_\_\_\_ (1 pt)  
(2) ploidy: \_\_\_\_\_ (1 pt)
- yeast (1) Class: \_\_\_\_\_ (1 pt)  
(2) ploidy: \_\_\_\_\_ (1 pt)
- bread mold: (1) Class: \_\_\_\_\_ (1 pt)  
(2) ploidy: \_\_\_\_\_ (1 pt)
- B. According to your lab handout, the fruit mold *Penicillium* is classified as a Deuteromycetes; however, recently this mold has been reclassified due to the discovery of a previously unknown characteristic. Based upon your knowledge of this mold, what is likely to have been the newly discovered characteristic? (4 pts)

Station 15. In front of you are examples of the two extreme strategies of how to disperse one's progeny away from oneself. In the dish are seeds of a milkweed, and next to these is a fleshy fruit.

Please list the advantages and disadvantages TO THE PLANT of having one's progeny dispersed by wind relative to having them be dispersed by an animal using a fruit?

**ADVANTAGES TO THE PLANT** of wind dispersal relative to animal dispersal -

**DISADVANTAGES TO THE PLANT** of wind dispersal relative to animal dispersal -