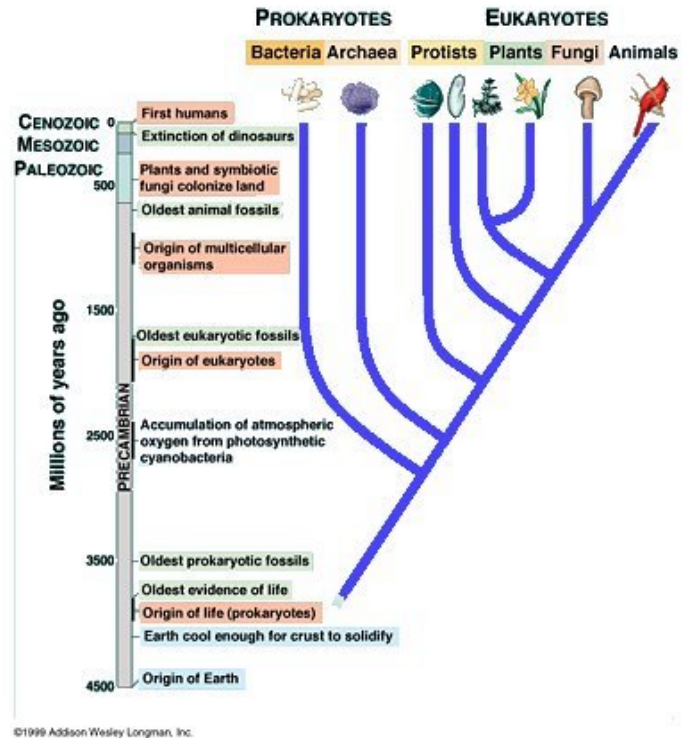


Question Set 1: Lab 1 – PLANT EVOLUTIONARY BIODIVERSITY

(1) Discuss what are the basic principals of Phylogenetic Systematics? According to these principles, what is the tree diagram at right supposed to show?

(6 pts)

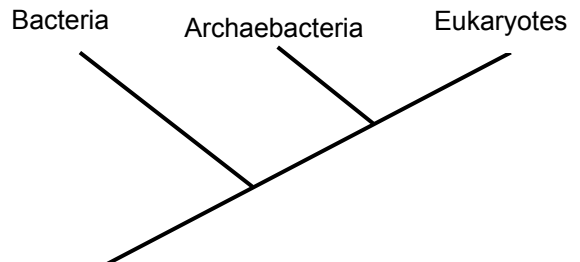


(2) Two key terms, “homology vs. analogy” have been defined to distinguish “shared derived characters” from similarity in characters that result from evolutionary convergence. What are the definitions of these terms? Note you must correctly explain and use the concept of a “shared derived character” in your response.

(10 pts)

Question Set 1 (con.): Answer either question A or B in the space below:

A. What is misleading about the name of the large Domain of prokaryotic life called the “Archaeobacteria.” What does this name mean? Examine the figure at right and explain according to the principles of phylogenetic systematics if these organisms deserve their name?



-or-

B. The best explanation for the evolution of eukaryotic life from the available lineages of prokaryotic bacteria is the “serial endosymbiotic hypothesis.” Briefly, what is the evidence for this hypothesis? Please use diagrams in your explanation.

- or -

C. Describe the structure and function of the prokaryotic cell wall. Use a figure in your description. How do the various major groups of prokaryotes differ in their cell walls? What are the advantages and disadvantages of having a cell wall?

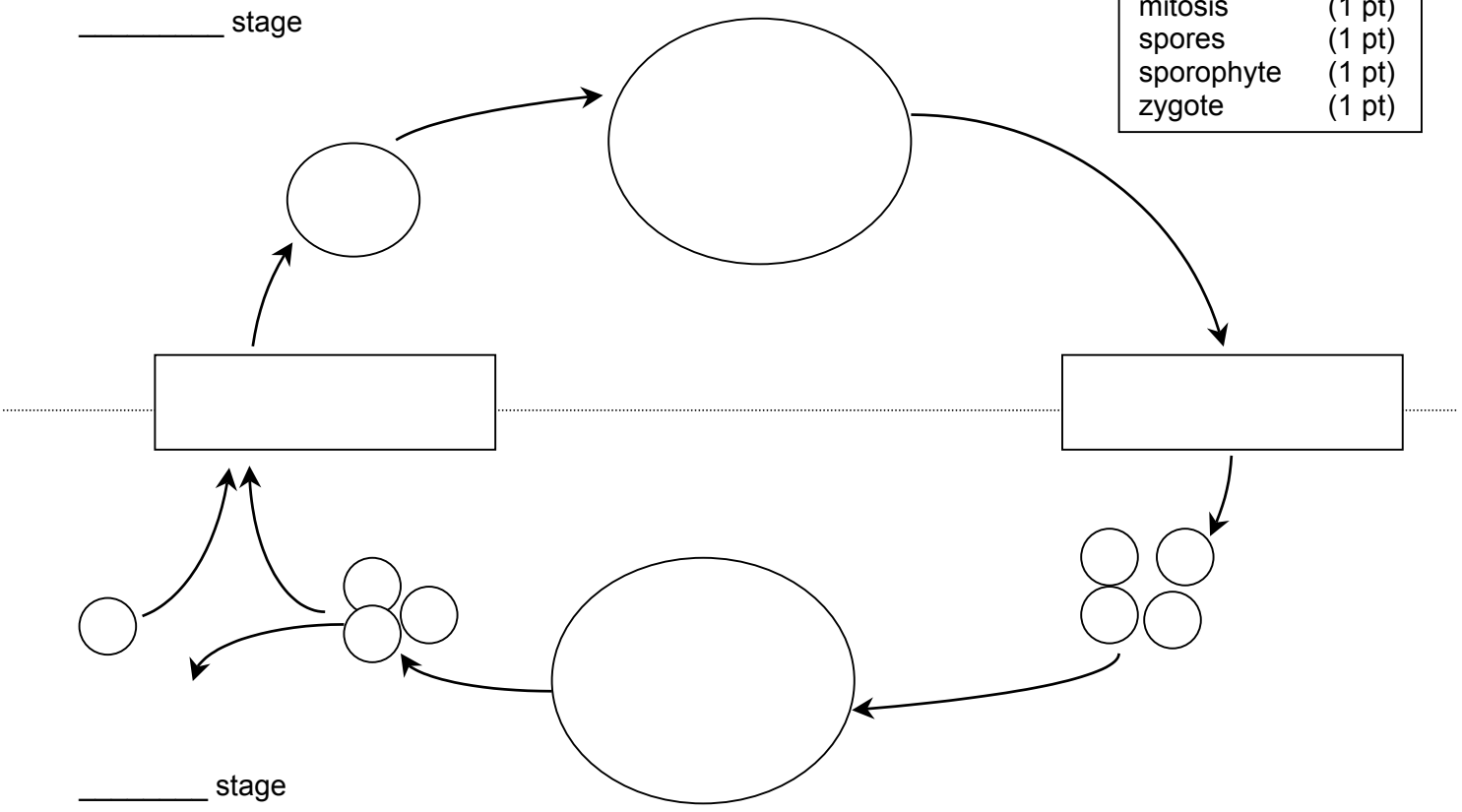
(3) A B C ???

(10 points)

Question Set 2: Lab 2 – PLANT STRUCTURE AND FUNCTION

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

- | | |
|---------------|--------|
| diploid stage | (1 pt) |
| fertilization | (1 pt) |
| gametes | (1 pt) |
| gametophyte | (1 pt) |
| haploid stage | (1 pt) |
| meiosis | (1 pt) |
| mitosis | (1 pt) |
| spores | (1 pt) |
| sporophyte | (1 pt) |
| zygote | (1 pt) |



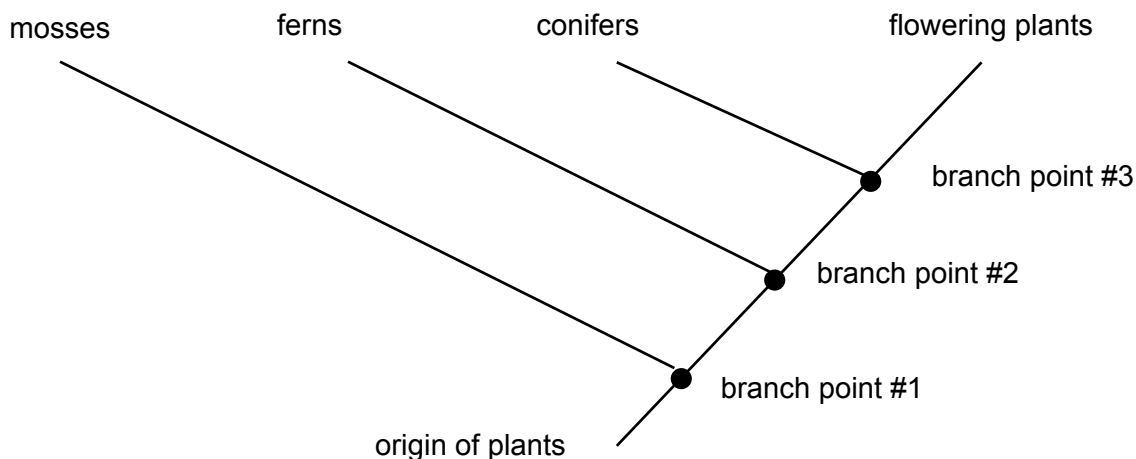
(10 pts)

(2). A major characteristic of plants is the "alternation of generations" during plant life cycles. What exactly alternates?

(3 pts)

Question Set 2 (con.): Answer all questions on this page.

(3) Consider the diagram below showing the evolutionary relationships among the major groups of plants:



- (a). Branch point #1 marks the evolution of what major characteristics? These characteristics are found in all plants that derive to the RIGHT and are lacking in mosses that derive to the LEFT.
(5 pts)
- (b). Branch point #2 marks the evolution of what major characteristics? These characteristics are found in all plants that derive to the RIGHT and are lacking in ferns that derive to the LEFT.
(5 pts)
- (c). Branch point #3 marks the evolution of what major characteristics? These characteristics are found in all plants that derive to the RIGHT and are lacking in conifers that derive to the LEFT.
(5 pts)

Question Set 2 (con.): Answer either question A or B in the space below.

A. Please explain the delayed meiosis hypothesis for the evolution of alternation of generations in the life cycle.

-or -

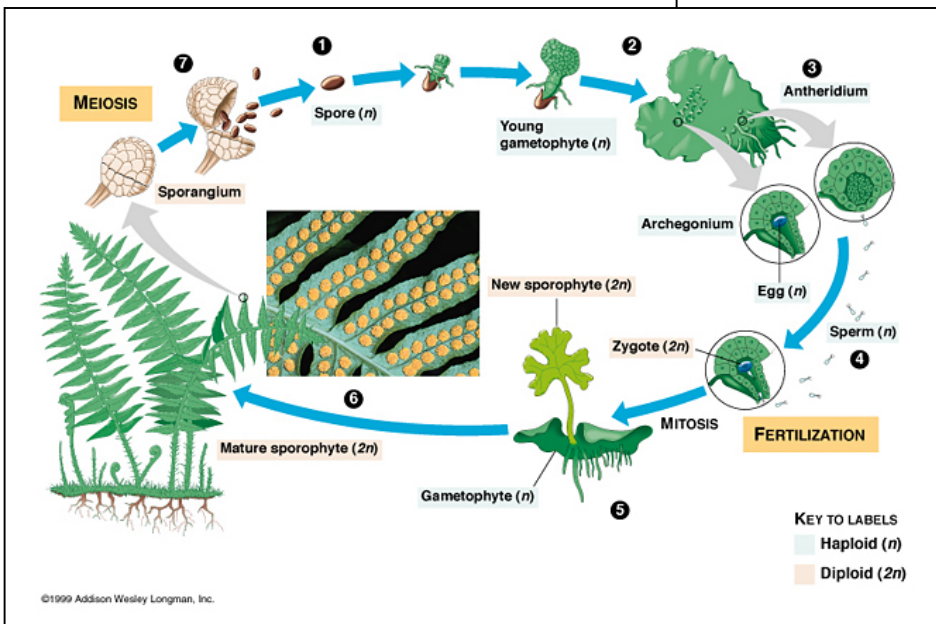
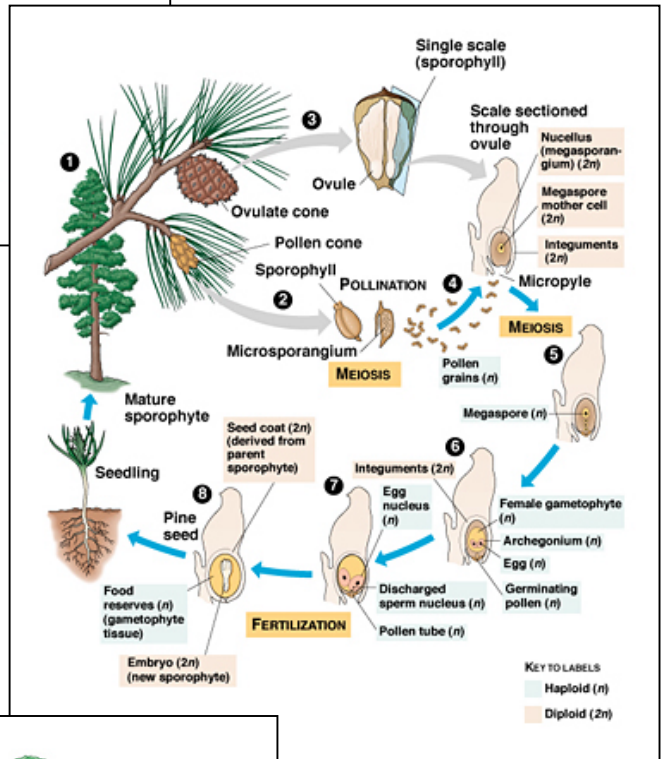
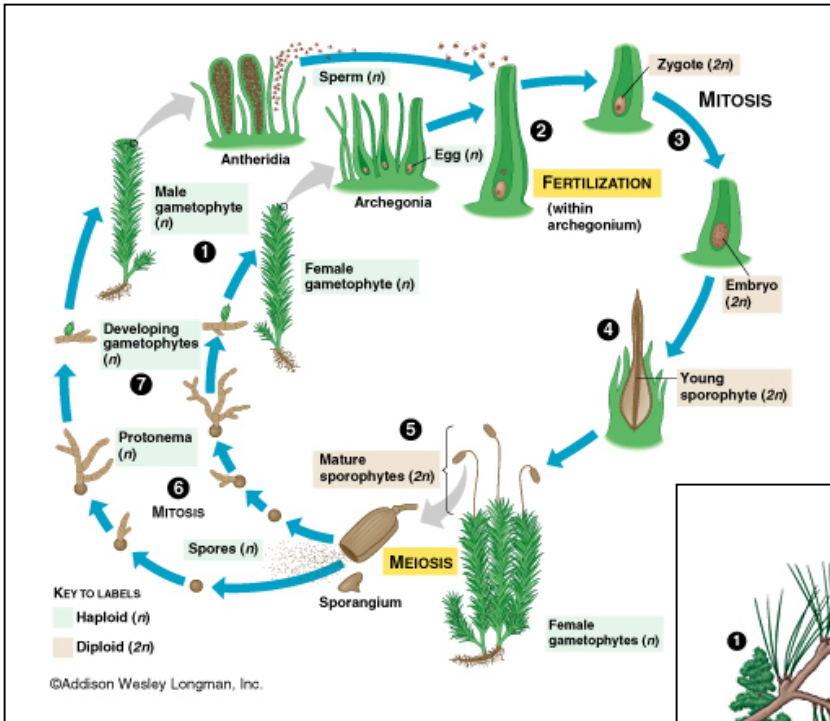
B. Please examine the life cycles of the fern and the gymnosperm (on the next page) and compare and contrast the major similarities and differences among these life cycles, and explain the major trends in evolutionary change apparent in these life cycles.

-or -

C. Please examine the life cycles of the moss and the fern (on the next page) and compare and contrast the major similarities and differences among these life cycles, and explain the major trends in evolutionary change apparent in these life cycles.

(4) A B C ???

(10 points)



Question Set 3: Lab 3 – STOMATA

- (1) Why might there be a higher density of stomata for leaves in the sun than leaves in the shade? Please note that you must use all of the terms in the box at right correctly in your response.

(15 points)

carbon dioxide evaporative cooling evolution adaptation leaf temperature natural selection photosynthesis

Question Set 3 (con.): Answer all questions on this page.

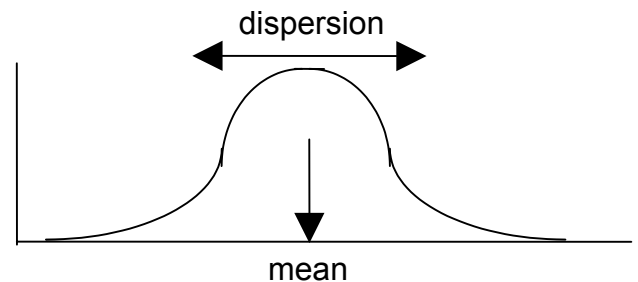
- (2) State in one sentence what is the function of the “t-test,” that is, exactly what is it used to do? (4 points)
- (3). The equation for the t-test (assuming unequal variances) is:

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

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).

(4 points)

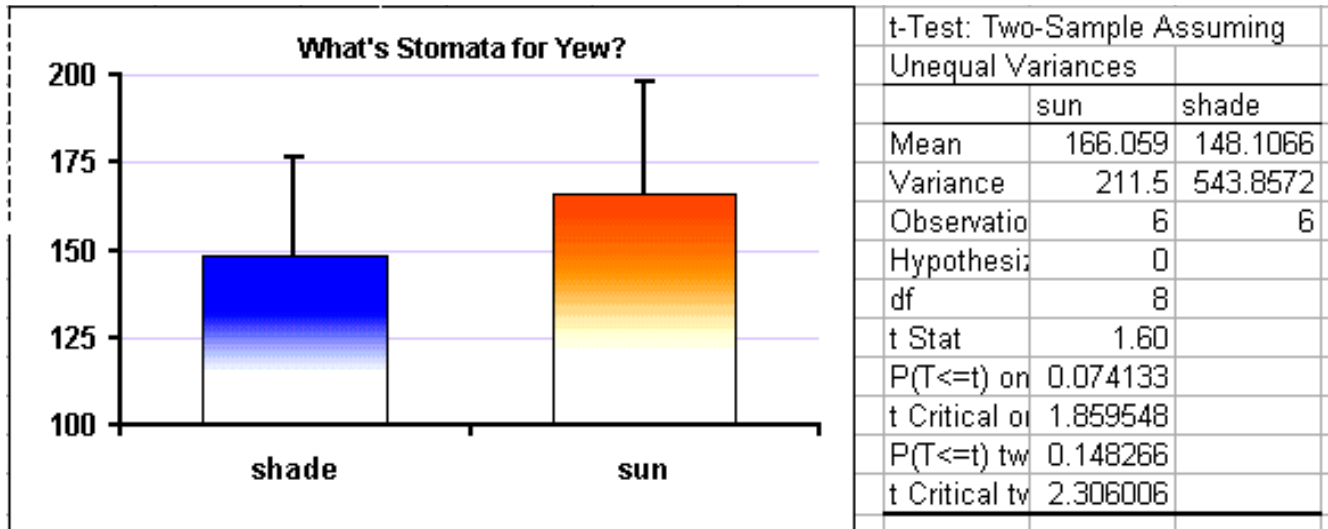
Figure 1.



Question Set 3 (con.): Answer all questions on this page.

(4) Below is an analysis table and graph of stomata data (on a yew plant for the sun versus shade). According to this analysis, is there a significant difference between the density of stomata in the sun versus the shade?

Yes or No ?? (5 pts)



(5) Explain exactly what information on this printout gives you the answer to the above question? (5 pts)

(6) How confident are you about this conclusion? Please use specific numbers from the figure above to justify your response. (4 pts)

Question Set 3 (con.): Answer either question A or B in the space below.

A. How exactly do stomata open and close? How do guard cells work? Specifically explain the roles of K⁺ ions, plant water balance, CO₂, and blue light.

-or-

B. Why might it be adaptive for stomata to occur mostly (if not entirely) on the undersides of leaves? What plants show the reverse pattern for which stomata are only on the upper leaf surface?

-or-

C. Some cacti thrive in some of the hottest deserts on earth where water is extremely scarce for most of the year. How are cacti adapted in their stem morphology and photosynthetic pathways (hint: CAM) to survive and proliferate in desert environments.

(7) A B C???

(10 points)

Question Set 4: Lab 5 – FRUITS AND FLOWERS

(1). Please examine the flower diagram at right and place the appropriate letter next to each of the terms below:

ovary _____ (1 pt)

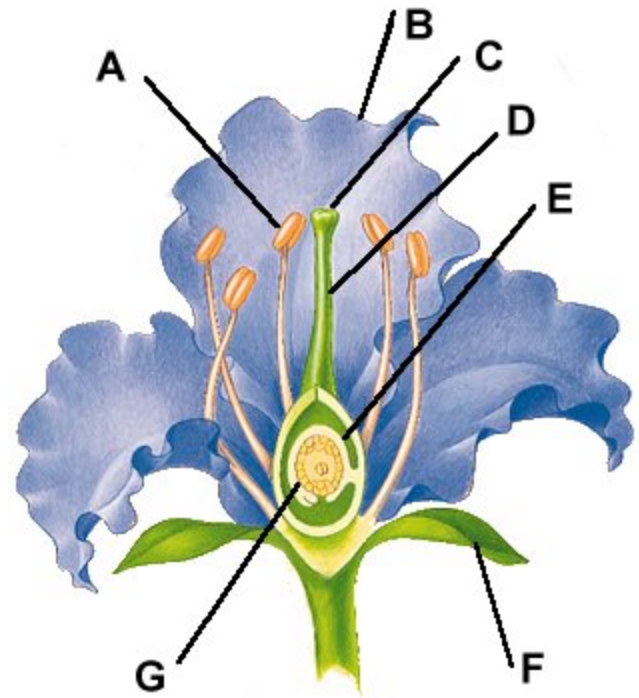
style _____ (1 pt)

anther _____ (1 pt)

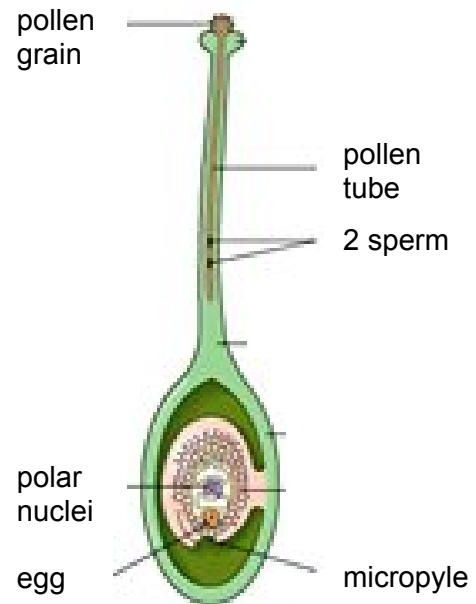
stigma _____ (1 pt)

sepal _____ (1 pt)

petal _____ (1 pt)



(2). Angiosperms are noted for a unique method of ovule fertilization known as “double fertilization” Please refer to the figure at right and briefly explain “double fertilization.”



(8 pts.)

Question Set 4 (con.): Answer one of these in the space below.

- A. Explain how the evolution of pollen and seeds represents one of the most important adaptations of plants to terrestrial environments.
- B. Please compare and contrast the advantages and disadvantages of pollination by wind (as in all conifers) versus pollination by animals (as in most angiosperms)? Explain the economic costs and benefits of wind versus animal pollination.
- C. Please briefly define “mutualistic coevolution.” How does the concept of “mutualistic coevolution” account for the evolution of resource intensive showy, oddly shaped, and fragrant flowers?
- D. Please briefly define “mutualistic coevolution.” How does the concept of “mutualistic coevolution” account for the evolution of elaborate resource intensive fleshy fruits within which many angiosperm seeds are encased?
- E. Please compare and contrast the advantages and disadvantages of seed dispersal by wind versus seed dispersal using fleshy fruits by animals? Explain the economic costs and benefits of wind versus animal seed dispersal.

(3) A B C D E ???

(10 points)

Question Set 5:

What is the one really good question from the lab material this semester that you were prepared to answer that WE DID NOT ASK YOU ON THIS EXAM? And, what is the answer to that question?

(1). the question WE DID NOT ASK YOU ON THIS EXAM -

(note: think carefully about what question you put down here – it must be a question that warrants a detailed response of at least ½ a page. Your maximum score for part (b) will depend on the degree of difficulty of the question you ask here [just like diving!])

(5 pts)

(2). its answer -

(10 pts)

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