Examination Three: Due Monday 24 November before 12 Midnight California Time

Notes: Although there is a minimum word count of 2,000 words for this exam, you will find that it is likely going to require more than the minimum to fully answer the question. You may not copy or quote from any source. All information must be re-written in your own words. Answer all questions. Point value: 100 points. Read the course Style Guide for detailed instructions of structure and format. Exams must be submitted by the due date and time. **Late Exams are NOT accepted without prior approval. Submit early to Turnitin.com**

Do not include the question(s) in your essays and exams.

Question 1: Primary and Secondary Growth (25 points)

Describe and discuss primary and secondary growth in plants. Include in your answer:

a. the definitions of primary and secondary growth and the locations where they are initiated
b. the cell types and tissues produced by primary and secondary growth and their functions
c. a comparison of the architecture of primary tissues in monocots and eudicots
d. a comparison of the architecture of secondary tissues in gymnosperms and angiosperms

Question 2: Water Movement (25 points)

Describe and discuss the transpiration stream in the plant body. Include in your answer:

a. a description of the paths that water takes entering the root and the roles of the root endodermis
b. a description of water and the principles involved in tension and the problem of cavitation and embolism and how this is resolved
c. a description of the release of water and the absorption of carbon dioxide through stomata
d. a comparison of the "typical" leaf and the leaf of Bigpod Ceanothus and how this leaf increases photosynthetic surface area while reducing leaf size and water loss through transpiration

Question 3: Solute Movement (25 points)

Describe and discuss the solute stream in the plant body. Include in your answer:

a. a description of the cells and tissues of food production and food storage tissues of flowering plants
b. a description of the special association of sieve elements, companion cells and bundle sheath cells
c. a description of the biomolecules that are transported as food and nitrogen carriers
d. a description of how phloem conducts food from source to sink according to the pressure flow hypothesis including phloem loading in a leaf, the passage of sucrose from palisade mesophyll to sieve element (including polymer trapping), the flow through the phloem, and phloem unloading in a root

Question 4: Plant Life Histories and the Evolution of Seeds (25 points)

Describe the alternation of generations life histories of seedless and seed producing vascular plants using ferns and gymnosperms as examples. Include in your answer:

a. compare and contrast the structures and processes of the life histories of ferns and pines
b. a description of how homosporous ferns can produce male and female gametophytes
c. a description of the changes in structure and function of the tissues and stages that led to the development of the seed
d. a full description of what defines a seed

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