**Quiz 3 – Study Guide**

The questions below are intended to focus your study efforts – but you should also gain a command of the bolded terms and concepts in our posted lecture notes. (Included here is material for a lecture on xylem and phloem function, which will occur on Wednesday March 7. Just ignore the xylem & phloem section while studying for quiz #3). Diagrams that we drew together in class have a high probability of being represented on quizzes and midterms.

**February 26 lecture - 1° Tissues and Leaves**

1) Which meristems give rise to primary (herbaceous) tissues, and which give rise to secondary tissues (wood and bark)?

2) Name and identify the three types of organs, tissues, and cells that we studied (I am unlikely to have you list cells types, but the terms parenchyma, collenchyma, and sclerenchyma should at least be familiar to you).

3) What is ground tissue?

4) What do 2° xylem, fibers, and sclereids have in common? How are they different?

5) What's a vascular bundle?

6) What is xylem? Phloem? Was does each transport?

7) What is the fundamental trade-off in the size or a foliage leaf vs. its ability to function?

8) What are leaf adaptations for avoiding: 1) water loss/ overheating; 2) predation; 3) physical damage due to wind

9) What is a tendril? A bud scale? A sclerophyllous leaf (sclerophyll)? A spine?

10) Draw the cross section of a typical foliage leaf and clearly label: Palisade mesophyll (parenchyma), spongy mesophyll (parenchyma), stomata (including guard cells and stomatal pore or opening), cuticle, epidermis, xylem, phloem, trichomes, the vein.

11) What cells are found in the shells of walnuts and other nuts and makes them resistant to deformation? The same cells give pears their "gritty" texture.

12) What is a petiole?

13) What is the meaning of the word root "phyll"

14) What is a cotyledon?

15) In addition to cotyledons, what are the two differences we discussed in the leaves of monocots vs. dicots?

**February 28 lecture – 1° Tissues art II; roots and carnivorous leaves (note: my posted lecture notes for the carnivorous leaves material appear in the posted lecture notes for February 26 1° Tissues and Leaves".**

1) Draw the three types of carnivorous plants we discussed, and emphasize the role of trichomes and how the leaf blades have been adapted for their role in catching prey items.

2) Why do some plants trap animals?

3) Describe the soils in which carnivorous plants grow. Is what you've just described a selective pressure? Explain.

4) Why does the closing motion of sundews (*Drosera* spp.) not need to be rapid as in Venus' flytrap?

5) In pitcher plants (*Darlingtonia* spp.) why might a flying insect remain in flight in an attempt to escape, but ultimately not find its way out even though flying until exhausted?

6) In pitcher plants (*Darlingtonia* spp.), what is inside the base of the plant that helps to finally kill a trapped prey item?

7) In pitcher plants (*Darlingtonia* spp.) that do not produce their own digestive enzymes, how do they digest the bodies of prey?

8) What two primary functions do roots serve?

9) Draw and explain the structural difference between a taproot system and a fibrous root system.

10) What type of roots do most monocots have? Dicots?

11) What are the roots called that extend "sideways" off of a taproot?

12) Define and describe the function of the various specialized roots that we discussed: storage roots, pneumatophores, aerial roots, prop roots, buttress roots.

13) Provide an example of a plant that produces storage roots, pneumatophores, aerial roots.

14) What is a velamen and why is it important for epiphytes such as orchids?

15) What is an epiphyte?

16) What is the meaning of the word root “phyte”?

**March 5 lecture - Stems**

1) On a stem, be able to identify: leaf, node, internode, axil, axillary bud, apical meristem location.

2) What is a meristem?

3) What does “apical dominance” refer to?

4) Explain the role of auxin in inhibiting and stimulating axillary bud development?

5) Why does pruning of a dominant stem (one containing an active apical meristem) cause axillary buds to develop into lateral branches?

6) What are two causes, in nature, that lead to very low or zero [auxin] in the region near an axillary bud? What will happen in/to the axillary bud as a result?

7) Regarding the two causes you listed above: explain how they are adaptive traits for a plant. That is to say, what is adaptive about a plant “waiting” until one of these two conditions is encountered rather than simply releasing from dormancy the apical meristem(s) in its axillary buds as soon as they are formed? Another way to think about this is as follows: what fate(s) or condition(s) does a plant avoid by not immediately allowing axillary buds to develop, but instead regulating their development via apical dominance?

8) Explain how to prune a plant with alternate leaf arrangement (such as a rose bush or apple tree) in order to ensure a finished product with a vase shape (an open interior). You should be able to draw an unpruned rose bush and then demonstrate where cuts should be made, and the subsequent elongation of axillary buds into lateral branches, such that a plant with a vase shape and open interior takes form.

9) Regarding the vase shape of the rose plant you pruned above, what are the advantages of this form?

10) How specifically does the herbicide 2,4 D work? How was it discovered, and why was it used in Vietnam?

11) Why are dicots but not monocots such as grasses affected by 2,4 D? (i.e., why is 2,4 D referred to as a "selective" herbicide?)

12) Diagram the distribution of auxin in a stem experiencing phototropism. What is phototropism, anyways?!

13) We identified many specialized stems – you should be familiar with them all! Be able to draw, identify, and compare/contrast the structure and role of: stolons, rhizomes, corms, bulbs, succulent stems, thorns. (Note, we will introduce or review these in lab, depending upon how much material we covered in lecture).

**March 7 lecture – xylem and phloem function**

1) Have a death grip on the following vocab and structures (death grip = know where they are, what they do, be able to draw them or ID them in a photograph…)

- vessel cell (element)
- vessel
- tracheid
- pit/ pit pair
- perforation plate
- sieve cell (element)
- companion cell
- sieve tube
- sieve plate
- P-protein (we didn't cover this – perhaps it will appear as extra credit).

2) What material in secondary cell walls makes them highly durable?

3) Diagram the pathway that a water molecule takes from the soil to the leaf and then into the atmosphere as it moves through plant tissues. On your diagram, label the pertinent strucutres and physical processes by which water enters the root, moves upwards through the trunk/stem, and exits the leaf. (I am 99.9% certain this question will appear on the exam as a ~10 point question!)

4) Explain the relationship between aphids, ants, and ladybugs. Be SPECIFIC!!! What do aphids provide, and where/how do they get it?!!

**Questions #5 and #6 will not appear on the exam other than as extra credit!! Consult the lecture notes and the URL contained therein, or perhaps we will cover this at the review session.**

*5) Using a diagram, explain the pressure-flow hypothesis for sugar transport in phloem. Label your diagram – labeled strucutres should include: sieve cells/sieve tube, companion cells, source, sink, osmosis, xylem, water, phloem loading.*

*6) Diagram a bordered pit pair, including the torus, and explain how it prevents the spread of embolism in xylem that has been damaged.*