

Quiz 3 study guide

Use this as a study guide for quiz #3, and use it in combination with the “quiz #2 study guide” as a study guide for **Midterm #2** (which is **Monday October 16!!**). Included here is material for a lecture on secondary metabolites, which will occur on Wednesday October 11. (Just ignore the 2° metabolite section while studying for quiz #3). In addition to answering the question below, you should also study the posted lecture notes and be able to define & explain all bolded vocabulary and concepts.

October 4 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 structures 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 structures 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.*

October 9 lecture – 2° tissues – wood and bark

1) I will provide you with a cross section of a woody stem, or perhaps I will ask you to draw one, and you will need to identify the following structures/features:

- outer bark
- cork cambium
- secondary phloem (inner bark)
- secondary xylem (wood)
- annual growth rings
- vascular cambium
- rays
- heartwood
- sapwood

Also – be able to identify a year in which growth was rapid (a wide growth ring) vs slow (a narrow growth ring). I might ask you to identify a fire scar from a cross section...but I haven't decided yet! (I am 99.9% certain that this question will appear on the exam as an 8-10 point question!)

2) Using a diagram of the cellular structure of a woody stem, explain the difference between a hardwood tree and a softwood tree. Provide an example (i.e., common name) of a tree of each type.

3) Do hardwoods or softwoods have vessels?

4) Do flowering plants have vessels in their wood?

5) What is another name for “wood”?

6) what is another name for “inner bark”?

7) Using a diagram of a woody stem, explain the difference between spring wood (aka early wood) and summer wood (aka late wood).

8) What is girdling?

9) Why does harvest of the outer bark of *Quercus suber* not kill the tree, and why does the outer bark regrow?

10) Why does harvest of cinnamon kill cinnamon trees?

The following content might have been covered in lab during week 8 (if we ran out of time in lecture) and you need to know this for lecture assessments...

11) List 3 applications of dendrochronology.

13) What is the scientific name of the tree species that has the oldest individual trees on Earth? Approximately how old are the oldest individual trees of this species?

14) What is establishment growth?

- 15) Are palm trees monocots or dicots?
- 16) Do palm trees make growth rings in their wood?
- 17) Do palm trees have a vascular cambium?

October 11 lecture – secondary metabolites

Overall: study the posted lecture notes – these are very detailed and straight-forward for this lecture. These notes serve as the study guide for this lecture. Sample questions follow below (I will draw heavily from this list of questions, but other material on the lecture notes is fair game).

- 1) Define the difference between primary and a secondary metabolite. Provide an example of each.
- 2) What are the three classes of secondary metabolites?
- 3) From which class of secondary metabolites have humans manufactured many well-known pharmaceutical and “recreational” drugs?
- 4) What is the defining or characteristic basic molecular structure of the alkaloids and terpenoids? (alkaloids = N atom in a ring – usually!; terpenoids = isoprene subunits; phenolics = phenol subunits.)
- 5) What’s the oldest known record of opium poppy production; from what plant is morphine derived, from what plant is cocaine derived?
- 6) Which class of secondary metabolites have names that typically end in “-ine”.
- 7) What are the characteristics of alkaloids?
- 8) What is latex?
- 9) What is the longest terpenoid molecule?
- 10) What is vulcanization? Who pioneered this chemical process? Is he (and his heirs...) rich?
- 11) What is allelopathy?
- 12) Essential oils are what type of secondary metabolite?
- 13) Essential oils have two fundamental roles in plant/animal interactions. What are these two roles?
- 14) What chemical property of essential oils helps them accomplish the functions that you identified in the above question?
- 15) What was the link we discussed between essential oils and bee-keeping (aside from pollinator attraction).

16) Bayer pharmaceutical company developed and sold what two important drugs in the late 1800's/early 1900's?

17) Cocaine and morphine have been used medicinally for what purposes?

18) What role do most alkaloids, such as cocaine, nicotine, morphine, theobromine, and caffeine have in plants? That is to say, how do they increase a plant's survival and reproduction?

19) Why is your veterinarian keenly aware of theobromine?

20) What is "Black leaf 40"? From what plant species is the active ingredient isolated?

21) For cocaine, morphine, theobromine, know the following:

A) the plant/plants from which each is isolated (by humans)

B) the region of the world in which each is native (where each plant naturally occurs), and

C) know the important products (many of which are historical) that humans harvest or make from each plant.

22) Why do plants make capsaicin in the fruits if the purpose of a fruit is to attract a seed disperser?

23) What is the Scoville scale?

24) Salicylic acid was first isolated from what type of tree?

25) Salicylic acid is the chemical precursor of what important human pharmaceutical drug?

26) What gives creeks and streams in forests/jungles their "tea-colored" water?

For the secondary metabolite lecture – know the three classes of secondary metabolites, and know the basic molecular structure that defines each group. (alkaloids = N atom in a ring – usually!; terpenoids = isoprene subunits; phenolics = phenol subunits.) Review the lecture notes for this lecture – they are three pages and bulleted with facts and bits of trivia. Know details such as: what's the oldest known record of opium poppy production; from what plant is morphine derived, from what plant is cocaine derived, what role does morphine, cocaine, and caffeine play in plants, why do plants make capsaicin in the fruits if the purpose of a fruit is to attract a seed disperser, what is the Scoville scale, which class of secondary metabolites have names that typically end in "–ine". I am likely to roll these bits of information into multiple choice questions and matching questions for the *Scantron* portion of the exam – so be sure to have a command of this info as it is presented on the lecture notes.