**BCH/PLS/PPA 609 1st section exam March 5, 2015 (100 points)**

Each question is worth a total of 25 points.

1. Most molecules in plants contain hydrogen, carbon and oxygen. CO2 fixation and subsequent reduction of the CO2 fixation products provides building blocks of most other molecules in plants. Give the chemical names or structures of all intermediates starting with CO2 fixation in photosynthetically active leaf chloroplasts of “source” tissue to acetyl-CoA in developing seeds of “sink” tissue. Include the form of fixed carbon translocated from source to sink tissues.
2. Compare and contrast the biosynthesis, structure and function of cellulose and starch.

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Describe the other main cell wall carbohydrates in addition to cellulose and how they interact with cellulose and lignin in cell wall structure.

1. Fatty acids are key components of plant membranes and storage oil. The vast majority of plant fatty acids in membranes of all plant tissues are one of 5 ubiquitous fatty acids with a 6th fatty acid also universally found in photosynthetically active chloroplasts but only in phosphatidyl glycerol with the full chemical name of trans-Δ3-hexadecenoic acid or trans-Δ3-16:1. The structure of trans-Δ3-16:1 is:



Give the structure and chemical names of the other 5 more common and ubiquitous fatty acids found in all plant tissues. Which of these fatty acids are ω-3? Describe how their structures affect the physical properties and function of plant cell membranes.

Describe the major constituents of wax & cutin of plant surface cuticles.

1. Most large-scale corn (*Zea mays*) farmers at least in the US currently usually inject ammonia, NH3, into soil to provide fixed nitrogen for the corn crop. What chemical transformations does the NH3 injected into the soil usually undergo and what is the main form in which fixed nitrogen is taken up by the corn roots. Compare and contrast the metabolism of the main form in which fixed nitrogen is taken up by corn roots with biological fixation of dinitrogen, N2. Include all steps from the uptake of the nitrogen by the roots to the export of the fixed nitrogen carrier molecules in the phloem to other plant tissues.

What are the main similarities and differences of nitrogen and sulfur metabolism in plants.