Syllabus: Fall 2018 – BCHM/HORT 640

Plant Metabolic Biochemistry (Metabolic Plant Physiology)

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When: Tuesdays and Thursdays 1:30 - 2:45 PM, Fall Semester

Where: HORT Building Room 222

Office hours: By appointment

Prerequisite(s): HORT 301 - Plant Physiology, or equivalent

Recommended Textbook:

"Biochemistry and Molecular Biology of Plants, Second Edition" (Buchanan BB, Gruissem W, Jones RL), American Society of Plant Biologists, Rockville, MD, 2015

Course Objectives

This 3-credit, 15-week course will be taught by Drs. Natalia Dudareva and Josh Widhalm. Students will be introduced to basic principles of plant metabolism including the mechanisms of uptake of small molecules from the environment and their elaboration into increasingly more complex structures via primary and secondary metabolism. A major emphasis will be placed on plant carbon metabolism (photosynthesis, respiration, lipid biosynthesis, carotenoid and terpenoid biosynthesis), nitrogen, sulfur and secondary metabolism in plants, and interconnections between these metabolic networks. The course will introduce students to the various tiers of regulation of these pathways and efforts to genetically engineer them to enhance plant productivity, increase plant stress tolerance, and improve nutritional quality and economic value of harvested organs.

Grading

The course grade will be determined by a combination of assignments, individual and team presentations, participation during discussion of assigned papers and a final mini-symposium presentation for a maximum total of 450 points, distributed as follows:
<table>
<thead>
<tr>
<th>Date</th>
<th>Subject</th>
<th>Points (450)</th>
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<tbody>
<tr>
<td>08/28/18</td>
<td>Presentation 1: Modifying cell walls for developing practical products (individual “lightning round” presentations)</td>
<td>20</td>
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<tr>
<td>09/13/18</td>
<td>Discussion paper 1</td>
<td>20</td>
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<td>09/18/18</td>
<td>Presentation 2: Strategies for Genetic Manipulation of Photosynthesis (team presentations)</td>
<td>40</td>
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<td>09/20/18</td>
<td>Discussion paper 2</td>
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<td>10/04/18</td>
<td>Debate: the two-pathway model of SA biosynthesis in plants</td>
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<td>10/18/18</td>
<td>Discussion paper 3</td>
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<tr>
<td>10/23/18</td>
<td>Presentation 3: Genetic Engineering of Lipids (team presentations)</td>
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<td>10/25/18</td>
<td>Discussion paper 4</td>
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<td>11/15/18</td>
<td>Discussion paper 9</td>
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<td>11/20/18</td>
<td>Discussion paper 10</td>
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<td>11/29/18</td>
<td>Assignment: gene discovery exercise</td>
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<td>12/04/18</td>
<td>Mini-symposium presentations</td>
<td>100</td>
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Students scoring a total score of 375 - 450 points will be given a grade of A, further sub-divided as follows:

- 425 - 450 = A+
- 400 - 424 = A
- 375 - 399 = A-

Students scoring a total of 300 - 374 points will be given a grade of B, further sub-divided as follows:

- 350 - 374 = B+
- 325 - 349 = B
- 300 - 324 = B-

Students scoring a total of 225 - 299 points will be given a grade of C, further sub-divided as follows:

- 275 - 299 = C+
- 250 - 274 = C
- 225 - 249 = C-

Students scoring a total of 150 - 224 points will be given a grade of D, further sub-divided as follows:

- 200 - 224 = D+
- 175 - 199 = D
- 150 - 174 = D-

Students scoring a total of less than 150 points will be given a grade of F:

- Less than 150 = F
**Mini-symposium (100 points):** During the last week of classes, each student will be required to give a 15-minute presentation (12 minutes for talk and 3 minutes for questions) on a specialized metabolite chosen from a list provided by the instructors in late September. Students will be expected to cover aspects related to the compound’s distribution in the plant kingdom, its ecological function and if applicable, examples of its practical usage for humans. Students should also incorporate elements learned in the course to describe the metabolism of the compound, including primary metabolic pathway(s) providing precursors for biosynthesis of the compound, genes/enzymes involved in its biosynthesis, subcellular architecture of the pathway and what steps remain to be elucidated. Students should also discuss how the compound is extracted from plant tissues and what efforts, if any, have been made to produce it via metabolic engineering, breeding or other approaches.

**Lecture Schedule (assigned readings are from Biochemistry & Molecular Biology of Plants)**

**HORT640: Lecture 1, Week 1**
Lecture title: Introduction (Widhalm, Dudareva)
Date: August 21, 2018
Assigned reading: Chapter 1 “Membrane Structure and Membranous Organelles”
Objectives/topics covered:
- Provide an overview of course syllabus, resources, goals, assignments, and grades
- Why is plant metabolism unique?
- Introduce metabolic networks and subcellular architecture

**HORT640: Lecture 2, Week 1**
Lecture title: Cell Wall Overview (Widhalm)
Date: August 23, 2018
Assigned reading: Chapter 2 “The Cell Wall”
Objectives/topics covered: This lecture will focus on describing the general function, composition/building blocks and biosynthesis and assembly of plant cell walls.

**Presentation 1 assigned.** Students should receive approval of their paper from the instructors via email by Friday August 24th.

**HORT640: Lecture 3, Week 2**
Lecture title: Cell Wall Presentations (Widhalm, Dudareva)
Date: August 28, 2018
Objectives/topics covered: Through student presentations, this class period will provide information about metabolic engineering strategies to modify plant cell walls for producing practical products.

**Presentation 1.** Modifying cell walls for developing practical products. Each student will give a 5-minute “lightning round” Powerpoint presentation (maximum of three slides) on a recent
paper(s) reporting an attempt to modify plant cell walls for the development of biofuels, food, feed, fiber, or other products.

This assignment is worth 20 points.

HORT640: Lecture 4, Week 2
Lecture title: Overview of photosynthesis (Dudareva)
Date: August 30, 2018
Assigned Reading: Chapter 12: “Photosynthesis”
Objectives/topics covered:
  • To introduce some of the fundamental principles of photosynthesis, and to introduce some of the key players in the light and carbon reactions of photosynthesis.

HORT640: Lecture 5, Week 3
Lecture title: Photosynthesis: Light Reactions (Dudareva)
Date: September 4, 2018
Assigned Reading: Chapter 12: “Photosynthesis”
Objectives/topics covered:
  • Antennae: auxiliary light-harvesting pigment protein complexes in the photosystems
  • Structures of the photosystems in relation to their function
  • Electron transport pathways in chloroplast membranes
  • The Q-cycle in the chloroplast
  • ATP synthesis
  • Oxidation of water
  • Photosynthetic inhibitors

Presentation 2 assigned. Student teams should receive approval of their paper from the instructors via email by Friday September 7th.

HORT640: Lecture 6, Week 3
Lecture title: Carbon reactions in C₃ plants (Dudareva)
Date: September 6, 2018
Assigned Reading: Chapter 12: “Photosynthesis” and Chapter 13: “Carbohydrate Metabolism”
Objectives/topics covered: This lecture will focus on the carbon reactions of photosynthesis with special reference to C₃ plants. Specific topics to be considered are:
  • The Calvin Cycle - intermediates, enzymes, and stoichiometry
  • Rubisco - structure, activity, regulation
  • Light-linked regulation of other enzymes of photosynthesis
HORT640: Lecture 7, Week 4
Lecture title: Variations in CO₂ fixation: C₃ and C₄ plants (Dudareva)
Date: September 11, 2018
Assigned reading: Chapter 14 “Respiration and Photorespiration” and Chapter 12: “Photosynthesis”
Objectives/topics covered: This lecture will focus on the reactions of photosynthesis in C₃ plants when oxygen, rather than CO₂, is used as a substrate by Rubisco. It will also focus on variations in mechanisms of photosynthesis (CO₂ fixation) in the plant kingdom. Specific topics to be considered are:

- Rubisco - kinetics with respect to CO₂ and O₂
- Photorespiratory carbon oxidation (PCO) cycle
- Role of photorespiration in plants
- C₄ plant photosynthesis:
  - general mechanism
  - anatomy of a C₄ leaf
  - energetic costs of concentrating CO₂
  - light regulation of C₄ pathway enzymes
- Crassulacean Acid Metabolism (CAM); difference in regulation of PEP carboxylase between C₄ and CAM plants

Discussion paper 1 assigned (Schluter et al., 2017)

HORT640: Lecture 8, Week 4
Lecture title: Variations in CO₂ fixation: C₃ and C₄ plants (continued) (Dudareva)
Date: September 13, 2018
Assigned reading: Chapter 14 “Respiration and Photorespiration” and Chapter 12: “Photosynthesis”
Objectives/topics covered: This lecture will focus on the reactions of photosynthesis in C₃ plants when oxygen, rather than CO₂, is used as a substrate by Rubisco. It will also focus on the variations in mechanisms of photosynthesis (CO₂ fixation) in the plant kingdom.

Discussion paper for class today: Schluter et al., 2017 (20 participation points possible)

HORT640: Lecture 9, Week 5
Lecture title: Strategies for Genetic Manipulation of Photosynthesis team presentations (Widhalm, Dudareva)
Date: September 18, 2018

Presentation 2: Strategies for Genetic Manipulation of Photosynthesis (team presentations).
Working in teams of 3, choose a manuscript on strategies for genetic manipulation of photosynthesis (discuss this manuscript with Dr. Dudareva or Dr. Widhalm before developing
your presentation). Each team will make a 15-minute PowerPoint presentation with an additional 2-5 minutes for questions and discussion. The presentation should include:

- a brief introduction which states the goals and hypothesis tested,
- a description of the metabolic modifications performed,
- a brief description of obtained results, an explanation in the case of an unexpected outcome, and possible future experiments to achieve the initial goal.

This assignment is worth 40 points.

**Discussion paper 2 assigned (Feike et al., 2016)**

**HORT640: Lecture 10, Week 5**
Lecture title: Carbohydrate metabolism; sucrose and starch synthesis (Dudareva)
Date: September 20, 2018
Assigned reading: Chapter 13: “Carbohydrate Metabolism”
Objectives/topics covered: This lecture will focus on carbohydrate metabolism with special reference to sucrose and starch synthesis and degradation. Focus will be on regulation of these processes in a C3 mesophyll leaf (please note that regulation may differ in other cell types and organs ... these differences will be highlighted in this and subsequent Lectures). Specific topics to be considered are:

- Metabolite transporters between chloroplast and cytosol
- Biosynthetic pathways leading to synthesis of starch and sucrose
- Key enzymes of sucrose and starch synthesis and degradation, and their regulation

**Discussion paper for today: Feike et al., 2016 (20 participation points possible)**

**HORT640: Lecture 11, Week 6**
Lecture title: Glycolysis (Dudareva)
Date: September 25, 2018
Assigned reading: Chapter 13: “Carbohydrate Metabolism”
Objectives/topics covered: This lecture will focus on the reactions of glycolysis; reactions that convert hexose phosphates to the 3-carbon compounds PEP and pyruvate via triose phosphates (glyceraldehyde 3-P and dihydroxyacetone phosphate) in the cytosol. Specific topics to be considered are:

- Intermediates and enzymes of glycolysis
- Regulation of PFK (ATP-dependent phosphofructokinase)
- Metabolic bypasses (adaptations to Pi-deficiency)
- Alcohol and lactate fermentation under anaerobic stress

**HORT640: Lecture 12, Week 6**
Lecture title: Citric acid cycle (Dudareva)
Date: September 27, 2018
Assigned reading: Chapter 14: “Respiration and Photorespiration”
Objectives/topics covered: This Lecture will focus on the carbon reactions of the citric acid cycle (TCA cycle; Krebs cycle). Specific topics to be covered include:
  - An overview of the general mechanism of oxidative phosphorylation in mitochondria.
  - Role of glycolysis and the citric acid cycle in producing intermediates for biosynthesis.
  - Conversions of PEP, pyruvate, oxaloacetate and malate.
  - The pyruvate dehydrogenase complex and its regulation.

HORT640: Lecture 13, Week 7
Lecture title: Hormones (Widhalm)
Date: October 2, 2018
Assigned reading: Chapter 17 “Biosynthesis of Hormones”
Objectives/topics covered: This lecture introduces the plant hormones (auxin, cytokinin, gibberellins, brassinosteroids, ethylene, abscisic acid, jasmonates, and salicylates) through their roles, during the plants life, from seed-to-seed. The biosynthesis, transport, perception, signal transduction and downstream effects of each are introduced, as well as a few ways that hormonal signaling pathways intersect.

Debate reading assigned (Dempsey et al., 2011; focus on pages 2-7, section “SA Biosynthesis”)

HORT640: Lecture 14, Week 7
Lecture title: Hormones (continued) (Widhalm)
Date: October 4, 2018
Assigned reading: Chapter 17 “Biosynthesis of Hormones”
Objectives/topics covered: This lecture introduces the plant hormones (auxin, cytokinin, gibberellins, brassinosteroids, ethylene, abscisic acid, jasmonates, and salicylates) through their roles, during the plants life, from seed-to-seed. The biosynthesis, transport, perception, signal transduction and downstream effects of each are introduced, as well as a few ways that hormonal signaling pathways intersect.

Debate: Students will present, through discussion, the evidence supporting each of the two pathways for SA biosynthesis in plants and identify the steps remaining to be elucidated. Students will then determine, based on the presented evidence, if the two-pathway model is the best model to describe how plants synthesize SA.

Presentation 3 assigned. Student teams should receive approval of their paper from the instructors via email by Friday October 12th.

October 9, 2018 No Class, October break
HORT640: Lecture 15, Week 8
Lecture title: Structure and function of lipids; fatty acid biosynthesis (Widhalm)
Date: October 11, 2018
Assigned reading: Chapter 8 “Lipids”
Objectives/topics covered: This Lecture will focus on the structure and function of plant lipids, with special emphasis on fatty acid biosynthesis. Specific topics to be covered include:
- Definition of the term “lipids” and their diverse roles in plants
- Major classes of lipids; structures of fatty acids; nomenclature
- Fatty acid biosynthesis; overview; compartmentation
- Central role of acetyl-CoA and malonyl-CoA
- Acetyl-CoA carboxylase (ACCase)
- Fatty acid synthase (refers to all enzyme activities in fatty acid biosynthesis except ACCase)

HORT640: Lecture 16, Week 9
Lecture title: Fatty acid biosynthesis (contd.); synthesis of membrane lipids (Widhalm)
Date: October 16, 2018
Assigned reading: Chapter 8 “Lipids”
Objectives/topics covered: This Lecture will continue discussion of fatty acid biosynthesis, and introduce the synthesis pathway for membrane lipids. Specific topics to be covered include:
- The terminal steps in fatty acid biosynthesis
- Desaturation and elongation of C16 and C18 fatty acids
- Unusual fatty acids; long-chain fatty acids
- The prokaryotic and eukaryotic pathways of glycerolipid synthesis; compartmentation
- Synthesis of membrane lipids; synthesis of phosphatidate; the CDP-diacylglycerol and diacylglycerol pathways of phospholipid synthesis

Discussion paper 3 assigned (Park et al., 2014)

HORT640: Lecture 17, Week 9
Lecture title: Genetic engineering of lipids (guest lecture: Kristian Caldo)
Date: October 18, 2018
Assigned reading: Chapter 8 “Lipids”
Objectives/topics covered: This Lecture will continue discussion of fatty acid biosynthesis, with specific emphasis on genetic/metabolic engineering of lipid metabolism. Specific examples of metabolic engineering include:
- Improvement of oil quality
- Increasing oil yields
- Industrial applications
- High laurate
- Ricinoleic acid
- Gamma-Linolenic acid
- Biodegradable plastics

Discussion Paper 3 for today: Park et al., 2014 (20 participation points possible)
HORT640: Lecture 18, Week 10
Lecture title: Genetic Engineering of Lipids team presentations (Widhalm, Dudareva)
Date: October 23, 2018

Presentation 3: Genetic Engineering of Lipids team presentations. Working in teams of 3, choose a manuscript on genetic/metabolic engineering of lipid metabolism (discuss this paper with Dr. Dudareva or Dr. Widhalm before developing your presentation). Each team will make a 15-minute PowerPoint presentation with an additional 2-5 minutes for questions and discussion. The presentation should include:

- a brief introduction which states the goals and hypothesis tested,
- a description of the metabolic modifications performed,
- a brief description of obtained results, an explanation in the case of an unexpected outcome, and possible future experiments to achieve the initial goal.

This assignment is worth 40 points.

Discussion paper 4 assigned (Henry et al., 2018)

HORT640: Lecture 19, Week 10
Lecture title: Terpenoids (Dudareva)
Date: October 25, 2018
Assigned reading: Chapter 24: “Natural Products” (sections 24.1-24.6)
Objectives/topics covered: This lecture will focus on the synthesis of terpenoids; the most structurally varied class of plant natural products. This lecture will also focus on the synthesis of carotenoids; the pathway of synthesis is a branch of the isoprenoid pathway also involved in terpenoid biosynthesis. Specific topics to be considered are:

- The mevalonate and non-mevalonate pathways of synthesis of isopentenyl diphosphate (IPP)
- Synthesis of geranyldiphosphate from IPP
- Production of phytoene (C40)
- Synthesis of carotenoids from phytoene
- Engineering of carotenoid biosynthesis (golden rice)

Discussion paper 4 for today: Henry et al., 2018 (20 participation points possible)
Discussion paper 5 assigned (TBD)

HORT640: Lecture 20, Week 11
Lecture title: Nitrogen assimilation, uptake, and reduction (Widhalm)
Date: October 30, 2018
Assigned reading: Chapter 16 “Nitrogen and Sulfur” (sections 16.1-16.10)
Objectives/topics covered: This lecture will focus on the nitrate uptake systems in plants, and
the regulation of nitrate reduction to ammonia. Particular attention is given to the regulation of nitrate reductase.

Discussion paper 5 for today: TBD (guest discussion leader: Dr. Ying Li; 20 participation points possible)

HORT640: Lecture 21, Week 11
Lecture title: Nitrogen assimilation into amino acids (Widhalm)
Date: November 1, 2018
Assigned reading: Chapter 7 “Amino Acids” (section 7.2) and Chapter 14 (section 14.9)
Objectives/topics covered: This lecture will focus on the pathways of ammonia assimilation in plants. There is strong genetic and biochemical evidence that the main pathway of ammonia assimilation involves the glutamine synthetase-glutamate synthase cycle. Glutamate dehydrogenase primarily functions in glutamate catabolism in plants. This Lecture will also focus on the interconversions of glycine and serine, with emphasis on the glycine decarboxylase complex, serine transhydroxymethylase, and the involvement of tetrahydrofolate in these reactions. This series of reactions interfaces with plant one-carbon (C1) metabolism involved in the synthesis of many secondary plant products. This Lecture will also focus on the role of aminotransferases in amino acid biosynthesis. The central role of pyridoxal phosphate as a cofactor will be discussed.

Discussion paper 6 assigned (Latimer et al., 2018)

HORT640: Lecture 22, Week 12
Lecture title: Branched-chain amino acids (guest lecture: Joe Lynch)
Date: November 6, 2018
Assigned reading: Chapter 7 “Amino Acids” (sections 7.4-7.6)
Objectives/topics covered: This lecture will focus on the biosynthesis of the branched-chain amino acids (valine, leucine and isoleucine) and the aspartate family amino acids threonine and lysine. Isoleucine derives its carbon skeleton from threonine. This Lecture also provides an overview of proline, arginine and ornithine biosynthesis.

Discussion paper 6 for today: Latimer et al., 2018 (20 participation points possible)
Discussion paper 7 assigned (Aarabi et al., 2016)

HORT640: Lecture 23, Week 12
Lecture title: Sulfur uptake and assimilation (Widhalm)
Date: November 8, 2018
Assigned reading: Chapter 16 “Nitrogen and Sulfur” (sections 16.11-16.18)
Objectives/topics covered: This lecture will focus on the uptake and metabolism of sulfate to the sulfur amino acids cysteine and methionine, and the various metabolic fates of these amino acids.
acids (e.g. glutathione, glucosinolates, S-adenosyl-methionine, SMM, ethylene).

Discussion paper 7 for today: Aarabi et al., 2016 (20 participation points possible)
Discussion paper 8 assigned (Widhalm et al., 2015)

HORT640: Lecture 24, Week 13
Lecture title: Histidine and aromatic amino acids (Dudareva)
Date: November 13, 2018
Assigned reading: Chapter 7: “Amino Acids” (sections 7.3 and 7.7)
Objectives/topics covered: This lecture will provide an overview of the pathways of synthesis of histidine, phenylalanine, tyrosine and tryptophan in plants.

Discussion Paper 8 for today: Widhalm et al., 2015 (20 participation points possible)
Discussion paper 9 assigned (Zhang et al., 2015)

HORT640: Lecture 25, Week 13
Lecture title: Phenylpropanoids (Widhalm)
Assigned reading: Chapter 24 “Natural Products” (sections 24.14-24.19)
Date: November 15, 2018
Objectives/topics covered: This lecture will focus on the functions and biosynthetic pathways of phenylpropanoid-derived compounds, including flavonoids, isoflavonoids, anthocyanins, lignin, lignans, volatiles, coumarins, benzoic acids, and other compounds. Through the discussion paper, students will learn how regulation of upstream primary metabolism can affect downstream production of specialized compounds and how this regulation can be harnessed through metabolic engineering.

Discussion Paper 9 for today: Zhang et al., 2015 (20 participation points possible)
Discussion paper 10 assigned (Lau and Sattely, 2015)

HORT640: Lecture 26, Week 14
Lecture title: Other plant specialized metabolites (Widhalm)
Date: November 20, 2018
Assigned reading: Chapter 24 “Natural Products” (sections 24.7-24.13)
Objectives/topics covered: This lecture will provide an overview of the biosynthesis and functions of other aromatic amino acid-derived plant natural products, including cyanogenic glycosides, glucosinolates and alkaloids. Through the discussion paper, students will learn about some of the modern approaches being used to dissect specialized metabolite pathways in non-model plants.

Discussion Paper 10 for today: Lau and Sattely, 2015 (20 participation points possible)
November 22, 2018. No Class, Thanksgiving Vacation

HORT640: Lecture 27, Week 15
Lecture title: Principles of metabolite analysis and metabolomics (guest lecture: Manoj Ghaste)
Date: November 27, 2018
Objectives/topics covered:
• Separation and quantification of metabolites
• Ion exchange chromatography
• Thin layer chromatography
• Gas chromatography and GC-MS
• Liquid chromatography and LC-MS

HORT640: Lecture 28, Week 15
Lecture title: Approaches to gene discovery (Widhalm, Dudareva)
Assigned reading: TBD
Date: November 29, 2018
Objectives/topics covered:
Gene discovery exercise assigned. This assignment is due via email to instructors by 12 PM on Friday December 7th. This assignment is worth 30 points.

HORT640: Lectures 29 and 30, Week 16
Lecture title: Mini-symposium [student presentations] (Widhalm, Dudareva)
Date: December 4 and December 6, 2018

Assignment (mini-symposium): each student will be required to give a 15-minute presentation (12 minutes for talk and 3 minutes for questions) on a specialized metabolite chosen from a list provided by the instructors in late September. Students will be expected to cover aspects related to the compound’s distribution in the plant kingdom, its ecological function and if applicable, examples of its practical usage for humans. Students should also incorporate elements learned in the course to describe the metabolism of the compound, including primary metabolic pathway(s) providing precursors for biosynthesis of the compound, genes/enzymes involved in its biosynthesis, subcellular architecture of the pathway and what steps remain to be elucidated. Students should also discuss how the compound is extracted from plant tissues and what efforts, if any, have been made to produce it via metabolic engineering, breeding or other approaches.

This assignment is worth 100 points
Attendance

The resources of Purdue University are provided for the intellectual development of its students. Courses with defined schedules are provided to facilitate an orderly and predictable environment for learning, as well as to provide assurance of a registered student's right to access the course. Scheduled courses allow students to avoid conflicts and reflect the University's expectation that students should be present for every meeting of a class/laboratory for which they are registered. Faculty are responsible for organizing and delivering a course of instruction and for certifying student accomplishment on the basis of performance.

Students are expected to attend every scheduled class. If you have a valid excuse for missing class, including illness, family emergency, religious observation, military requirement, University-sponsored activity, or any other absence recognized by Purdue, the instructor will provide you the information missed. Students missing class without a valid excuse will not receive assistance from the instructors in obtaining missed material. For additional information, consult the official Purdue policy on class attendance:
http://www.purdue.edu/studentregulations/regulations_procedures/classes.html

Course evaluation

During the last two weeks of the semester, you will be provided an opportunity to evaluate this course and your instructor(s). On Monday of the 15th week of classes, you will receive an official email from evaluation administrators with a link to the online evaluation site. You will have two weeks to complete this evaluation. Your participation in this evaluation is an integral part of this course. Your feedback is vital to improving education at Purdue University. I strongly urge you to participate in the evaluation system.

Academic misconduct

Academic misconduct of any kind will not be tolerated in any course offered by the Department of Biochemistry. Information on Purdue’s policies with regard to academic misconduct can be found at
http://www.purdue.edu/studentregulations/student_conduct/regulations.html

Any incidence of academic misconduct will be reported to the Office of the Dean of Students. Academic misconduct may result in disciplinary sanctions including expulsion, suspension, probated suspension, disciplinary probation, and/or educational sanctions. In addition, such misconduct will result in punitive grading such as:

• receiving a lower or failing grade on the assignment, or
• assessing a lower or failing grade for the course

Punitive grading decisions will be made after consultation with the Office of the Dean of Students. Please note reported incidences of academic misconduct go on record for
reference by other instructors. Further, a record of academic misconduct is likely to influence how current/future situations are handled.

To provide you with an unambiguous definition of academic misconduct, the following text has been excerpted from "Academic Integrity: A Guide for Students", written by Stephen Akers, Ph.D., Executive Associate Dean of Students (1995, Revised 1999, 2003), and published by the Office of the Dean of Students in cooperation with Purdue Student Government, Schleman Hall of Student Services, Room 207, 475 Stadium Mall Drive West Lafayette, IN 47907-2050.

“Purdue prohibits "dishonesty in connection with any University activity. Cheating, plagiarism, or knowingly furnishing false information to the University are examples of dishonesty." [Part 5, Section III-B-2-a, Student Regulations] Furthermore, the University Senate has stipulated that "the commitment of acts of cheating, lying, and deceit in any of their diverse forms (such as the use of substitutes for taking examinations, the use of illegal cribs, plagiarism, and copying during examinations) is dishonest and must not be tolerated. Moreover, knowingly to aid and abet, directly or indirectly, other parties in committing dishonest acts is in itself dishonest." [University Senate Document 72-18, December 15, 1972]

More specifically, the following are a few examples of academic dishonesty which have been discovered at Purdue University.

- substituting on an exam for another student
- substituting in a course for another student
- paying someone else to write a paper and submitting it as one's own work
- giving or receiving answers by use of signals during an exam
- copying with or without the other person's knowledge during an exam
- doing class assignments for someone else
- plagiarizing published material, class assignments, or lab reports
- turning in a paper that has been purchased from a commercial research firm or obtained from the internet
- padding items of a bibliography
- obtaining an unauthorized copy of a test in advance of its scheduled administration
- using unauthorized notes during an exam
- collaborating with other students on assignments when it is not allowed
- obtaining a test from the exam site, completing and submitting it later
- altering answers on a scored test and submitting it for a regrade
- accessing and altering grade records
- stealing class assignments from other students and submitting them as one's own
- fabricating data
- destroying or stealing the work of other students
Plagiarism is a special kind of academic dishonesty in which one person steals another person's ideas or words and falsely presents them as the plagiarist's own product. This is most likely to occur in the following ways:

- using the exact language of someone else without the use of quotation marks and without giving proper credit to the author
- presenting the sequence of ideas or arranging the material of someone else even though such is expressed in one's own words, without giving appropriate acknowledgment
- submitting a document written by someone else but representing it as one's own

Academic integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breaches of this value by either emailing integrity@purdue.edu or by calling 765-494-8778. While information may be submitted anonymously, the more information that is submitted provides the greatest opportunity for the university to investigate the concern.

Purdue's Honor Pledge was developed by students to advance a supportive environment that promotes academic integrity and excellence. It is intended that this pledge inspires Boilermakers of all generations to stay "on track" to themselves and their University. “As a boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together - we are Purdue.”

**Notice of copyright protection of course materials**

Among the materials that may be protected by copyright law are the lectures, notes, and other material presented in class or as part of the course. Always assume the materials presented by an instructor are protected by copyright unless the instructor has stated otherwise. Students enrolled in, and authorized visitors to, Purdue University courses are permitted to take notes, which they may use for individual/group study or for other non-commercial purposes reasonably arising from enrollment in the course or the University generally.

Notes taken in class are, however, generally considered to be “derivative works” of the instructor’s presentations and materials, and they are thus subject to the instructor’s copyright in such presentations and materials. No individual is permitted to sell or otherwise barter notes, either to other students or to any commercial concern, for a course without the express written permission of the course instructor. To obtain permission to sell or barter notes, the individual wishing to sell or barter the notes must be registered in the course or must be an approved visitor to the class. Course instructors may choose to grant or not grant such permission at their own discretion, and may require a review of the notes prior to their being sold or bartered. If they do grant such permission, they may revoke it at any time, if they so choose.
Nondiscrimination policy statement

Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life.

Purdue University views, evaluates, and treats all persons in any University related activity or circumstance in which they may be involved, solely as individuals on the basis of their own personal abilities, qualifications, and other relevant characteristics. Purdue University prohibits discrimination against any member of the University community on the basis of race, religion, color, sex, age, national origin or ancestry, genetic information, marital status, parental status, sexual orientation, gender identity and expression, disability, or status as a veteran. The University will conduct its programs, services and activities consistent with applicable federal, state and local laws, regulations and orders and in conformance with the procedures and limitations as set forth in Purdue’s Equal Opportunity, Equal Access and Affirmative Action policy which provides specific contractual rights and remedies. Additionally, the University promotes the full realization of equal employment opportunity for women, minorities, persons with disabilities and veterans through its affirmative action program.

Any question of interpretation regarding this Nondiscrimination Policy Statement shall be referred to the Vice President for Ethics and Compliance for final determination.

For additional information: http://www.purdue.edu/purdue/ea_eou_statement.html

Accessibility and accommodations

Academic accommodations must be arranged through the Disability Resource Center https://www.purdue.edu/drc/. The instructors are 100% committed to make sure all necessary accommodations are met so that all students have the opportunity to learn. If there is any additional support that we may offer, please do not hesitate to contact the instructors.

Purdue University strives to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, you are welcome to let me know so that we can discuss options. You are also encouraged to contact the Disability Resource Center at: drc@purdue.edu or by phone: 765-494-1247.

Safe Zone statement

I am a member of a Safe Zone Ally community network, and I am available to listen and support you in a safe and confidential manner. As a Safe Zone Ally, I can help you connect with resources on campus to address problems you may face that interfere
with your academic and social success on campus as it relates to issues surrounding sexual orientation and gender identity. My goal is to help you be successful and to maintain a safe and equitable campus.

**Preferred name/pronouns**

We will gladly honor your request to address you by an alternate name or gender pronoun. Please advise us of this preference early in the semester so that we may make appropriate changes to our records.

**Campus emergency and adverse weather procedures**

Emergency preparedness is your personal responsibility. Purdue University is actively preparing for natural disasters or human-caused incidents with the ultimate goal of maintaining a safe and secure campus.

- For any emergency call 911.
- There are nearly 300 Emergency Telephone Systems throughout campus that connect directly to the Purdue Police Department (PUPD). If you feel threatened or need help, push the button and you will be connected to the PUPD.
- If we hear a fire alarm, we will immediately evacuate the building by directly exiting outside through the door at the front right of the room.
- If we are notified of a Shelter in Place requirement for a tornado **warning**, we will shelter in the lowest level of this building away from windows and doors. Our preferred location is the basement. We will proceed out of the lecture room entrance (the door you come in) and take the stairs into the basement. Once in the basement, proceed to the end of the hallway to accommodate other people coming down the stairs.
- If we are notified of a Shelter in Place requirement for a hazardous materials release, we will shelter in our classroom shutting any open doors and windows.
- If we are notified of a Shelter in Place requirement for a civil disturbance, such as a shooting, we will shelter in a room that is securable preferably without windows. Our preferred location is in the lecture hall.


When harsh weather is a possibility, Purdue administrators continuously monitor forecasts to ensure public safety. The university uses several systems to alert the campus community about weather-related changes to class schedules or work hours, starting with the Purdue home page. For more information on weather preparedness: [http://www.purdue.edu/newsroom/health_safety/weather.html](http://www.purdue.edu/newsroom/health_safety/weather.html)

**Sexual misconduct reporting**

Purdue University and your instructor are committed to providing all community members with a learning and work environment that is free from sexual harassment and
assault. As instructors and/or faculty members, instructional staff have a mandatory reporting responsibility in this area. We will seek to keep such information private to the greatest extent possible. However, we are required by law to share information we obtain regarding sexual misconduct or information about a crime that may have occurred on Purdue’s campus with the University. Students may speak to someone confidentially by contacting the Center for Advocacy, Response, and Education (CARE) at 765-495-CARE (2273). You have other options for getting help if you have experienced sexual assault, relationship violence, sexual harassment, or stalking. This information can be found at https://www.purdue.edu/sexual_assault/index.html.

CAPS information
Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, services are available. For help, such individuals should contact Counseling and Psychological Services (CAPS) at (765)494-6995 and http://www.purdue.edu/caps/ during and after hours, on weekends and holidays, or through its counselors physically located in the Purdue University Student Health Center (PUSH) during business hours.

DISCLAIMER
This syllabus is subject to change.