



Plant Biochemistry, Spring 2022

HOS 6932, Section 4C66, Class 22263

Meets: 10:40-11:30, MTWTh, on-line via zoom and in Fifield 2318, 4 graduate credits

Instructors:

Karen E. Koch 2147 Fifield Hall, 352-273-4833. kekoch@ufl.edu
 Donald R. McCarty 2237 Fifield Hall, 352-273-4846, drm@ufl.edu
 Bala "Saba" Rathinasabapathi 2247 Fifield Hall, 352-273-4847. brath@ufl.edu

Office hours: Meetings by appointment

Topics will include:

- Biochemical adaptations to biotic and abiotic stresses
- Biochemical basis for diverse plant responses and phenotypes
- Metabolic phenotypes and their influence on plant development
- Metabolic micro-environments and their significance
- Biochemistry of specialized products (caffeine, cannabinoids, theobromine, etc.)
- Biosynthesis, storage, and metabolism of key plant products.
- Structure and function of plant proteins, from enzymes and transporters to motors and proteomics
- Mechanisms of enzyme and transporter function, from kinetics to ligand binding
- Principles of metabolic modeling and flux balance analysis.
- Fundamental aspects of plant biochemistry and metabolism in an organismal context.

Tentative Lecture Schedule: 2020

Date	Day	Title	Presenter
Jan 5	W	Intro + Plant cell compartments and metabolic micro-environments	All
Jan 6	Th	Amino acids: Keys to protein structure and function	DM
Jan 10	M	Exploiting protein diversity for separation and purification	DM
Jan 11	Tu	Fundamentals of protein structure	DM
Jan 12	W	Non-covalent bonds in proteins	DM
Jan 13	Th	Thermodynamics and principles of enzyme catalysis	DM
Jan 17	M	MLK Day - no class	
Jan 18	Tu	Mechanisms of enzyme catalysis	DM
Jan 19	W	Proteomics methods – Sixue Chen, guest lecture	Sixue Chen
Jan 20	Th	Movers and shakers: Molecular motors couple ATP to motion	DM
Jan 24	M	Discussion, integration and review for exam 1	DM
Jan 25	Tu	Exam 1	DM
Jan 26	W	Light, photo-chemistry, and photoreceptors	KK
Jan 27	Th	Photosynthesis: Photo-systems, electron transport, ^+H gradient	KK
Jan 31	M	Antioxidants, redox reactions, protective systems	KK
Feb 1	Tu	Chinese New Year; Photosynthesis: CO_2 assim. photorespiration	KK
Feb 2	W	Photosynthesis: NO_3 , NO_2 , and NH_3 assimilation	KK

Feb 3	Th	C/N balance in C3, C4, and CAM photosynthesis	KK
Feb 7	M	Student presentations	KK et al.
Feb 8	Tu	Starch structure, biosynthesis, and metabolism	KK
Feb 9	W	Synthesis of sugars, amino acids, and their phloem transport	KK
Feb 10	Th	Regulation of photosynthesis: Feedback via gene repression	KK
Feb 14	M	Exam 2	KK
Feb 15	Tu	Sucrose import by sinks, its metabolism, sugar signaling	KK
Feb 16	W	Polysaccharides: Cell wall structure, biosynthesis, metabolism	KK
Feb 17	Th	Glycolysis: Overview, updates, significance	KK
Feb 21	M	Student presentations	KK et al.
Feb 22	Tu	Glycolysis: Regulation, significance, impacts	KK
Feb 23	W	Oxidative pentose phosphate pathway	KK
Feb 24	Th	Mitochondrial functions: Citric acid cycle, updates, significance	KK
Feb 28	M	Mitochondrial functions: Electron transport, ΔH gradients	KK
Mar 1	Tu	Regulation of primary metabolism	KK
Mar 2	W	Exam 3	KK
Mar 3	Th	Fatty acid desaturation	BR
		Spring break	
Mar 14	M	Fatty acid synthesis I	BR
Mar 15	Tu	Fatty acid synthesis II	BR
Mar 16	W	Fatty acid oxidation I	BR
Mar 17	Th	Fatty acid oxidation II	BR
Mar 21	M	Health promoting secondary products	BR
Mar 22	Tu	CBDs	BR
Mar 23	W	Flavonoids	BR
Mar 24	Th	Phenolics and ESPS synthase	BR
Mar 28	M	Terpene synthesis	BR
Mar 29	Tu	Carotenoids	BR
Mar 30	W	Alkaloids I	BR
Mar 31	Th	Alkaloids II	BR
April 4	M	Exam 4	BR
April 5	Tu	Thermodynamics of ligands binding to proteins	BR
April 6	W	Saturable binding of molecules to proteins	DM
April 7	Th	Cooperativity: Hill and Monod-Wyman-Changeux models	DM
April 11	M	Equilibrium enzyme kinetics	DM
April 12	Tu	Steady-state enzyme kinetics	DM
April 13	W	Allosteric enzymes: cooperative kinetics	DM
April 14	Th	Metabolic Control Analysis: kinetics applied to pathways	DM
April 18	M	Flux Balance Analysis: systems modeling of metabolism	DM
April 19	Tu	Discussion, integration and review for exam V	DM
April 20	W	Exam 5	DM
April 21	Th	Reading day	DM
April 22	F	Reading Day	DM

Instructors: DM (Donald McCarty), KK (Karen Koch), BR (Bala "Saba" Rathinasabapathi)

Course Prerequisites

A course in introductory biology that includes plant biology (BSC 2010/11 or equivalent) and a course in organic chemistry (CHM 2210/11 or equivalent) with a grade of C or better. Students are expected to be familiar with the chemistry and reactions of functional groups.

Required Textbooks

1. *Biochemistry & Molecular Biology of Plants*, Second edition, print or electronic version, 2015, Wiley Blackwell
2. A general biochemistry textbook - Check online booksellers for inexpensive older versions. The following is free online –
Biochemistry, 5th edition, by Berg, Tymoczko and Stryer, New York: WH Freeman, 2002,
<http://www.ncbi.nlm.nih.gov/books/NBK21154/>

Course Home Page

From e-Learning (Canvas): you will be able to access notes and lecture slides, take quizzes, view the course calendar, view exam scores, access study questions, read course announcements and find information concerning assignments.

Login. Go to <http://elearning.ufl.edu>, click on the Continue button under Canvas System Entry, and use your Gatorlink ID and password to login. If you cannot access e-Learning using this password, contact the computing helpdesk helpdesk@ufl.edu or call 392-HELP or visit them in the Hub to solve the problem.

Attendance Policy

Course grading will include class participation (discussions during class and ongoing dialog between students and faculty during presentations). Also, lecture notes and slide sets serve primarily as an outline to direct the content presented in lectures and should not be considered a detailed account of all content presented in the lectures. Occasional, unavoidable absences (1 or 2) will not necessarily impact student performance in the course. However, students should contact the course organizer to discuss options and strategies of how to make up missed work.

Quizzes and homework

Quizzes and homework assignments will be scheduled by each instructor.

Exams

There will be five exams, each worth 100 points. Exams are not comprehensive and will cover the lectures specified in the lecture schedule. However, some questions may require knowledge of material covered on previous exams. Some exams will be given in class, and others will be take-home. Exams will consist of questions (multiple-choice, fill in the blank, short and long answer) and problems. Exams will cover details of structure, function, and pathways, major concepts, problem solving, and data analysis.

Exams for the units on central metabolism (KEK on photosynthesis and respiration), exams will include oral and written presentations on topics of special relevance to students. This work will be independent, in-depth investigations into current and classical literature, along with interpretation and creative presentations to colleagues.

Make up exams and coursework will be given for legitimate excuses such as student illness or death in the immediate family. Make up exams that are requested for any other reason, will be given at the discretion of the instructor. These must be arranged ahead of the student's absence.

Grading scale

500 possible points from exams and up to 100 possible points from quizzes and homework assignments

Letter Grade	Grade Points	%	Letter Grade	Grade Points	%
A	4.0	92-100	C	2.0	65-68
A-	3.67	87-91	C-	1.67	60-64

B+	3.33	83-86	D+	1.33	55-59
B	3.0	79-82	D	1.0	52-54
B-	2.67	73-78	D-	0.67	50-53
C+	2.33	69-72	E	0	0-49

Information on current UF grading policies can be found in the Graduate Catalog at: <http://gradschool.ufl.edu/catalog/current-catalog/catalog-general-regulations.html>

Academic Honesty

The Honor Code for the University of Florida reads, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity”. You will sign all of your exam papers, which will confirm your pledge that you have neither given nor received unauthorized help in taking the exam.

Plagiarism: Please know the definition in an academic context. You may NOT use direct text from anyone or their website without “quotation marks.” Simple citation at the end of a borrowed section of their work is NOT adequate. It is also unacceptable to modify their wording slightly, and then add a quotation.

Software Use Policy

Students are expected to be informed of the University’s policy on use of proprietary software and use of IT resources. These policies can be found at: <http://www.it.ufl.edu/policies/aupolicy.html>

Accommodations for Students with Disabilities

Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student, who must then provide this documentation to the Instructor when requesting accommodation.

University Support Services

Resources are available on campus for students having test anxiety, personal problems or lacking clear career and academic goals that interfere with their academic performance. These resources include:

1. Counseling & Wellness Center, 301 Peabody Hall, 392-1575, personal and career counseling. <http://www.counseling.ufl.edu>
2. Student Health Care Center, 392-1161, personal counseling. <http://shcc.ufl.edu/>
3. Career Resource Center, Reitz Union, 392-1601, career development assistance and counseling. <http://www.crc.ufl.edu/>
4. Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Classroom etiquette

You are expected to be courteous to your fellow students and not interfere with their learning. You are expected to be on time, turn off cell phones, and talk only when the instructor asks you to do so. You may use a laptop or tablet during class lectures, although using such devices for texting and other forms of personal communication are strongly discouraged.