

Biochem / Nutritional Sciences 510 - BIOCHEMICAL PRINCIPLES OF HUMAN AND ANIMAL NUTRITION

Fall Semester 2018

Biochemical and physiological fundamentals of nutrition. Discussion of protein, fat, carbohydrate, and energy metabolism, the functions of minerals and vitamins, and their roles and inter-relationships in nutrition, metabolism and human/animal health. Biochemistry prerequisite.

Instructors: Professor David Eide (course director), Professor Brian Parks

Credits: 3

Day: MWF

Time: 8:50 AM – 9:40 AM

Location: Microbial Sciences 1520

Website (Learn@UW): <https://learnuw.wisc.edu/>

COURSE LEARNING OUTCOMES:

After completing this course you will:

1. understand nutrient metabolism in normal and disease states.
2. be able to integrate the regulation of metabolism of nutrients under these conditions.
3. understand the biochemical and molecular functions of nutrients we consume.
4. apply how nutrients affect pathogenesis and health.
5. be able to think critically about nutrient claims and fads using your knowledge of nutritional biochemistry.

REQUIRED TEXT:

Advanced Nutrition & Human Metabolism, 5th ed. Gropper, Smith and Groff. Thomson/Wadsworth (2009).

THE 6TH AND 7TH EDITIONS ARE ALSO ACCEPTABLE BUT NOTE THAT THE ASSIGNED PAGE NUMBERS DIFFER. We will provide page numbers for 6th AND 7th edition readings separately.

Many students find it useful to have available a biochemistry text such as *Biochemistry* by Nelson, Cox and Lehninger.

Lecture powerpoint files will be available on the course website prior to lectures.

MP3 audio recordings of the lectures will be posted on the website after the lectures.

GRADING POLICY:

Approximate point distribution

17%	Exam 1
17%	Exam 2
17%	Exam 3
17%	Exam 4
21%	Final Exam
10 %	Quizzes (3)

Grade distribution

A	90% and above
AB	88-89%
B	80-87%
BC	78-79%
C	70-77%
D	61-69%
F	< 61%

Exam points and quiz points are weighted equally. Exams will be held in class and worth 100 points each. Make-up exams are only given with prior notification and permission from Prof. Eide or Parks; we reserve the right to request written documentation of the absence reason. Exam regrades are permissible within 2 weeks of an exam/quiz but the entire exam/quiz will be regraded (exception: math errors made by the instructors will be corrected without regrading). The final exam will be worth 125 points and will be cumulative.

Exam	Covers (approx.)	Given
1	Sept 5 – Sept 28	Wednesday, Oct 3
2	Oct 1 – Oct 19	Wednesday, Oct 24
3	Oct 22 – Nov 9	Wednesday, Nov 14
4	Nov 12 – Nov 30	Wednesday, Dec 5
Final	~80% on material from Exams 1-4, ~20% on material from Dec 3 – Dec 12	

QUIZZES: Three announced quizzes (20 pts each) will be given and they will cover glycolysis, the TCA cycle, and redox concepts. There are no make-up quizzes without prior arrangement with the faculty.

ASSUMED KNOWLEDGE: An introductory biochemistry course is a **REQUIRED** prerequisite for enrollment in NS/Biochem 510 and the instructors expect you to already have a working knowledge of biochemical pathways and structures. You'll need to review/remember the following: glycolysis, the TCA cycle, the electron transport system, and the urea cycle. The emphasis of the course is on **INTEGRATION** of knowledge you have acquired in this and previous courses.

ATTENDANCE: We do not take attendance. However, you are expected to prepare for, attend, and participate fully in all lectures and you are responsible for obtaining material from any missed lectures. It is our experience that regular attendance is a good predictor of success in this course due to the volume and complexity of the material that we cover.

CREDIT HOUR POLICY: This class meets for three 50-minute class period each week over the spring semester and carries the expectation that students will work on course learning activities (reading, writing, problem sets, studying, etc) for about 2 hours out of classroom for every class period. The syllabus includes additional information about meeting times and expectations for student work.

CONTACT INFORMATION:

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Week	Date	Topic	Assigned Reading (5 th ed)
1	9/5	Digestion I: The gastrointestinal tract (Parks)	pp. 33-54
	9/7	Digestion II: Nutrient absorption and diseases of digestion (Parks)	pp. 59-61
2	9/10	CHO 1: Intro to Metabolism; CHO structures; CHO digestion; Absorption; (Parks)	pp. 251-254, 63-78
	9/12	CHO 2: Glycolysis; TCA Cycle; [In class quiz on glycolysis] (Parks)	pp. 78-90
	9/14	CHO 3: Gluconeogenesis; Other key pathways; Regulation of metabolism; (Parks)	pp. 95-99
3	9/17	CHO 4: Regulation of CHO metabolism; [In class quiz/TCA cycle] (Parks)	pp. 99-104
	9/19	Lipid 1: Lipid structures; Fatty acid synthesis; (Parks)	pp. 131-134, 161-6
	9/21	Lipid 2: Fatty Acid oxidation; Other key pathways; (Parks)	pp. 157-161
4	9/24	Prot 1: Amino acids; Digestion; Transport; General reactions of amino acids (Parks)	pp. 179-194
	9/26	Prot 2: AA uptake; AA catabolism; Plasma AA; Urea cycle and Regulation (Parks)	pp. 208-226
	9/28	MetInt 1: Review of metabolism (Parks)	pp. 251-256
5	10/1	Lipid I: Lipid structures; Digestion and Lipid Absorption (Parks)	pp. 131-44
	10/3	EXAM 1 (through MetInt I; 8 lectures)	--
	10/5	Lipid II: Lipoprotein metabolism (Parks)	pp. 144-57
6	10/8	Lipid III: Lipid metabolism and Energy balance (Parks)	pp. 157-70
	10/10	Metabolism I: Fed-Fast Cycle/Starvation (Parks)	pp. 256-61
	10/12	Metabolism II: Integration of Metabolism/Endocrinology (Parks)	pp. 261-63
7	10/15	Metabolism III: Cellular regulators of metabolism (Parks)	--
	10/17	Metabolism IV: Loss of Metabolic Integration/Diabetes (Parks)	pp. 264-65, 276-77
	10/19	Metabolism V: Obesity (Parks)	--
8	10/22	Vitamins and energy metabolism I: Acyl/acetyl transfers (pantothenate) (Eide)	pp. 309-11, 338-42
	10/24	EXAM 2 (Lipids I through Metabolism V; 8 lectures)	--
	10/26	Vitamins and energy metabolism II: Redox cofactors (niacin, riboflavin) (Eide)	pp. 329-38
9	10/29	Vitamins and energy metabolism III: Niacin and alcohol metabolism (Eide)	pp. 170-3
	10/31	Vitamins and energy metabolism IV: Decarboxylations (thiamin) (Eide)	pp. 323-8
	11/2	Vitamins and energy metabolism V: Carboxylations (biotin) (Eide)	pp. 342-8
10	11/5	Vitamins and energy metabolism VI: Decarboxylations, trans- & deaminations (pyridoxine)	pp. 364-9
	11/7	Vitamins and blood function I: 1-carbon transfer reactions (folate) (Eide)	pp. 348-57
	11/9	Vitamins and blood function II: 1-carbon transfer reactions (B12) (Eide)	pp. 358-63
11	11/12	Vitamins and blood function III: blood clotting (Vitamin K) (Eide)	pp. 409-16
	11/14	EXAM 3 (Energy metabolism I through B12; 8 lectures)	--
	11/16	Antioxidant nutrients I: Overview (Eide)	pp. 417-25
12	11/19	Antioxidant nutrients II: Vitamin E and carotenoids [in class quiz on redox concepts] (Eide)	pp. 401-8
	11/21	Antioxidant nutrients III: Vitamin C and Se (Eide)	pp. 311-21, 506-12
	11/23	Thanksgiving break	
13	11/26	Metal nutrients I: Fe Part I (Eide)	pp. 470-87
	11/28	Metal nutrients II: Fe Part II (Eide)	pp. 470-87
	11/30	Metal nutrients III: Cu (Eide)	pp. 488-505
14	12/3	Nutrients and hormones I: Iodine (Eide)	pp. 517-21
	12/5	EXAM 4 (Vitamin K through Cu; 7 lectures)	
	12/7	Nutrients and hormones II: Vitamin A (Eide)	pp. 373-90
15	12/10	Nutrients and hormones III: Calcium and Vitamin D (Eide)	pp. 431-41
	12/12	Nutrients and hormones III: Calcium and Vitamin D (Eide)	pp. 392-400, 461-5
	12/14	Final exam (cumulative, ~80% on Exam 1-4 material, ~20% on new material (4 lectures)	