

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

Spring Semester 2015

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 Dave Eide, Professor Roger Sunde, Gretchen Seim (Learning Intern)

Credits: 3

Day: MWF

Time: 7:45 AM – 8:35 AM

Location: Van Hise 114

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

### COURSE OBJECTIVES:

1. To understand nutrient metabolism in normal and disease states.
2. To learn how metabolism of nutrients is regulated.
3. To understand the biochemical and molecular functions of nutrients we consume in the diet.
4. To learn how nutrients affect pathogenesis and health.
5. 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 4<sup>TH</sup> EDITION IS ALSO ACCEPTABLE BUT NOTE THAT THE ASSIGNED PAGE NUMBERS DIFFER. We will provide page numbers for 4<sup>th</sup> 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

16.5 %	Exam 1
16.5 %	Exam 2
16.5 %	Exam 3
16.5 %	Exam 4
20 %	Final Exam
13 %	Quizzes (4)

#### 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 Prof. Sunde; 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 will be worth 125 points and will be cumulative.

Exam	Covers (approx.)	Given
1	Jan 21 – Feb 13	Wednesday, Feb 18
2	Feb 16 – Mar 6	Wednesday, Mar 11
3	Mar 9 – Mar 26	Wednesday, April 8
4	April 6 – April 22	Monday, April 27
Final	75% on material from Exams 1-4, 25% on material from April 24 – May 8	

**QUIZZES:** Four announced quizzes (20 pts each) will be given and they will cover glycolysis, the TCA cycle, the urea 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.

## CONTACT INFORMATION:

Dr. David Eide, Professor (263-1613)  
340B Nutritional Sciences  
eide@nutrisci.wisc.edu

Dr. Roger Sunde, Professor (262-4044)  
238B Nutritional Sciences  
sunde@nutrisci.wisc.edu

Gretchen Seim (262-3436)  
gseim@wisc.edu  
office hours M 8:45-9:45 NS 362

Week	Date	Topic	Text Reading (5 <sup>th</sup> edition)
1	1/21	Digestion I: The gastrointestinal tract	pp. 33-54
	1/23	Digestion II: Nutrient absorption and diseases of digestion	pp. 59-61
2	1/26	CHO I: Intro to Metabolism; CHO structures; CHO digestion	pp. 251-254, 63-71
	1/28	CHO II: Absorption; Glycolysis <b>[In class quiz on glycolysis]</b>	pp. 71-85
	1/30	CHO III: TCA Cycle; Gluconeogenesis; Other key pathways; Galactosemia	pp. 85-99
3	2/2	CHO IV: Regulation of metabolism; Diet effects; Regulation by location <b>[Quiz/TCA cycle]</b>	pp. 99-104
	2/4	CHO V: Allosteric regulation; Glucagon & Insulin regulation; Glycogen storage diseases	pp. 74-77
	2/6	Lipid I: Lipid structures; Digestion	pp. 131-142
4	2/9	Lipid II: Lipid absorption; Lipoprotein metabolism	pp. 142-157
	2/11	Lipid III: Fatty acid synthesis; Fatty Acid oxidation; Other key pathways; Regulation	pp. 157-167
	2/13	Lipid IV: Lipid metabolism and Energy balance	pp. 167-170
5	2/16	Prot I: Functional categories; amino acids; Digestion; Transport	pp. 179-194
	<b>2/18</b>	<b>EXAM 1 (through Lipid IV; 11 lectures)</b>	--
	2/20	Prot II: General reactions of amino acids	pp. 194-222
6	2/23	Prot III: Intestinal AA metabolism; AA uptake; AA catabolism; Plasma AA	pp. 222-234
	2/25	Prot IV: Urea cycle; Regulation of urea cycle <b>[In class quiz on urea cycle]</b>	pp. 210-211
	2/27	MetInt I: Review of metabolism; Role of organs in metabolism	pp. 251-256
7	3/2	MetInt II: Fed/Fasting cycles/Starvation	pp. 256-261
	3/4	MetInt III: Loss of Metabolic Integration/Diabetes	pp. 261-265, 276-277, 246-249
	3/6	MetInt IV: Cellular regulators of metabolism	--
8	3/9	Vitamins and energy metabolism I: Acyl/acetyl transfers (B5)	pp. 309-11, 338-42
	<b>3/11</b>	<b>EXAM 2 (Protein I through MetInt IV; 8 lectures)</b>	--
	3/13	Vitamins and energy metabolism II: Redox cofactors (niacin, riboflavin)	pp. 329-38
9	3/16	Vitamins and energy metabolism III: Niacin and alcohol metabolism	pp. 170-3
	3/18	Vitamins and energy metabolism IV: Decarboxylations (thiamin)	pp. 323-8
	3/20	Vitamins and energy metabolism V: Carboxylations (biotin)	pp. 342-8
10	3/23	Vitamins and energy metabolism VI: Decarboxylations, trans- & deaminations (B6)	pp. 364-9
	3/25	Vitamins and blood function I: 1-carbon transfer reactions (folate)	pp. 348-57
	3/26	Vitamins and blood function II: 1-carbon transfer reactions (B12)	pp. 358-63
Spring Break			
11	4/6	Vitamins and blood function III: blood clotting (Vitamin K)	pp. 409-16
	<b>4/8</b>	<b>EXAM 3 (Energy metabolism through B12; 8 lectures)</b>	--
	4/10	Antioxidant nutrients I: Overview	pp. 417-25
12	4/13	Antioxidant nutrients II: Vitamin E and carotenoids <b>[in class quiz on redox concepts]</b>	pp. 401-8
	4/15	Antioxidant nutrients III: Vitamin C and Se	pp. 311-21, 506-12
	4/17	Metal nutrients I: Fe Part I	pp. 470-87
13	4/20	Metal nutrients II: Fe Part II	pp. 470-87
	4/22	Metal nutrients III: Cu	pp. 488-505
	4/24	Metal nutrients IV: Zn	pp. 488-505
14	<b>4/27</b>	<b>EXAM 4 (Vitamin K through Cu; 7 lectures)</b>	--
	4/29	Nutrients and hormones I: Iodine	pp. 517-21
	5/1	Nutrients and hormones II: Vitamin A	pp. 373-90
15	5/4	Nutrients and hormones III: Calcium and Vitamin D Part I	pp. 431-41
	5/6	Nutrients and hormones IV: Calcium and Vitamin D Part II	pp. 392-400, 461-5
	5/8	Nutrition, genetics and nutrigenomics	--
<b>5/13</b>	<b>Final exam</b> (cumulative, ~75% on Exam 1-4 material, ~25% on new material (4/24-5/8 lectures))		