

**BIOC13 H3S**  
**Biochemistry II: Bioenergetics and Metabolism**  
**Winter 2013**

**Instructor:** Daman Bawa

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**Teaching Assistant:** Katrina Hiiback

**Office Hours:** Tuesdays 10:30 AM – 12:30 PM

**Please be prepared and consult lecture materials and online sources prior to coming to the office.** Appointments outside these hours can be arranged by e-mail for personal matters or emergencies.

**Lecture:** **Wednesdays: 11:00 AM – 1:00 PM (Room HW-216)**  
**Thursdays: 12:00 PM – 1 PM (Room SY-110)**

The best way to reach me outside the office hours is by e-mail. **Please use your UTSC or UTORONTO e-mail account** and include your course code in the subject.

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**Course Textbook:** **You can use any university level biochemistry textbook\*\***

**Textbooks available in the library:**

Voet, Voet and Pratt – Fundamentals of Biochemistry  
Berg, Tymoczko, Stryer – Biochemistry  
Garret and Grisham – Biochemistry  
Lehninger – Principles of Biochemistry  
Mathews – Biochemistry  
Horton – Principles of Biochemistry  
McKee - Biochemistry : the molecular basis of life

\*\* Each of the above texts contains similar information but presented in different formats and with varying detail. You may find reading subjects by different authors will help clarify difficult concepts. The publishers also have on-line resources (see course website) for their texts that you may find useful. The library also contains a number of additional biochemistry texts and resources.

## Evaluations & Dates:

Test	Material	Date	% of Final Grade
Quiz 1 (1 hour)	Based on <u>Lectures 1-3</u>	TBA	15
Mid- Term Exam* (2 hours)	Lecture material covered in <u>Lectures 1-6</u>	TBA	35
Final Exam* (3 hours)	Cumulative, with emphasis on second half of the course.  All course material will be tested	TBA	50

\* **Note:** the midterm and final exam may be held on a Friday night or Saturday morning

Marks for each test and exam will be posted on the intranet/blackboard and can be accessed via the course web page. It is each student's responsibility to check her/his grade and to resolve any problems **within 1 week of posting**.

**Quiz:** (Multiple choice questions, fill in the blanks and/or short answers)

The quiz may take place during one of the scheduled class times and will be at the beginning of class, DO NOT BE LATE. **There is no make up for a missed quiz**. A valid medical note/documentation will allow you to add your missed quiz evaluation weight to the weight of the midterm exam. Students who miss the quiz must provide valid documentation as soon as possible and inform me by e-mail, before or **within 48 hours** of the quiz. For medical reasons, **students must use the U of T Scarborough medical form** that is filled in by a medical doctor only.

**Midterm:** (Multiple Choice, Fill-in-the-blanks, Short answers)

Students who cannot make the midterm due to schedule conflicts or appointments **may arrange to write the test beforehand** with valid proof of conflict or medical needs. Students who miss the midterm must provide valid documentation (for example, UTSC medical certificate) and inform me by e-mail before the exam or **within 48 hours** of the exam. For medical reasons, **students must use the U of T Scarborough medical form** that is filled in by a medical doctor only. **Students will only be allowed to write the make up midterm upon receipt of valid documentation.**

**Final Exam:** (Multiple Choice, Fill-in-the-blanks, Short answers)

Students who miss the final exam must petition the Registrar for permission to write a makeup exam. This is not determined by the instructor. The Registrar will schedule a makeup exam that will be held at a later date.

**Accessibility:** If you have a disability/health consideration that may require accommodations, please feel free to contact me and/or the AccessAbility Services Office. All the enquiries will be kept confidential and we will work together to make sure that you can achieve your learning goals in this course. The UTSC AccessAbility Services staff (located in S302) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations (416) 287-7560 or [ability@utsc.utoronto.ca](mailto:ability@utsc.utoronto.ca).

## **BIOC13 Course Objectives:**

By the end of this course you should:

- › Understand the concepts of metabolism and how metabolism is regulated at the level of the cell and the whole organism
- › Understand which organic compounds are used as ‘fuel’ or metabolic substrates and understand how cells and organisms use these fuels
- › Know which metabolic pathways and reactions contribute to cellular metabolism
- › Understand the concepts of bioenergetics including determining and evaluating free energy and redox potential in relation to metabolism
- › Understand the central importance of ATP in energy currency
- › Know the mechanisms involved in the generation of ATP
- › Understand how enzymes and cofactors function in bioenergetic reactions
- › Be familiar with the molecular complexes and pathways involved in photosynthesis and carbon fixation (PSI, PSII and Calvin cycle)
- › Be familiar with the key steps in the main pathways of carbohydrate, fat, lipid and nitrogen metabolism (synthesis and breakdown), how they are regulated and their importance in normal physiology and pathology
- › Understand the switches in metabolic pathways during fasting and feeding
- › Appreciate the important roles of hormones in regulating metabolism
- › Be familiar with the concepts of transmembrane signalling, signal transduction and signal cascades
- › Be able to apply your knowledge of metabolism to your understanding of health and disease

### **Recommended Reading:**

Topics presented in this course can be found in all of the recommended texts. Use the table of contents and index to determine where topic specific information is located in the text you are using.

**Bioenergetics is an interesting but intensive course. The material may become overwhelming if you let the work accumulate.  
Please do not fall behind.**

**BIOC13 H3S (Winter 2013)**  
**Bioenergetics and Metabolism**  
**Lecture Schedule<sup>1</sup>**

	<b>Topics</b>	<b>Chapter<sup>2</sup></b>
	Introduction to bioenergetics and metabolism Review of key organic molecules Review of enzyme concepts Bioenergetics and ATP Gibbs Free Energy Redox Reactions and Reduction Potential	1, 14
	Glycolysis and Gluconeogenesis	15, 16
	The Citric Acid cycle	17
	Carbohydrate Chemistry: Glycogen metabolism, Pentose phosphate pathway; Control of carbohydrate metabolism	15, 16, 17
	Redox reactions: Electron Transport chain	18
	Electron Transport: Chemiosmosis	18
	Photosynthesis, PSI, PSII and Calvin cycle	19
	Fatty acid catabolism and biosynthesis	20
	Complex Lipids and regulation of lipid metabolism	20
	Regulation and integration of metabolic reactions Cellular control, physiologic control Hormonal control Exercise, starvation	22

<sup>1</sup>Sequence of topics covered. Dates may change depending on progress.

<sup>2</sup>Chapters here are from Voet, Voet & Pratt – Fundamentals of Biochemistry and are indicated as a guide only. The same topics are covered in other textbooks.

**\*\* If I talk about it in class its testable material\*\***