

# **CHEMISTRY 469, winter 2002**

## **Special Topics in Organic Chemistry: Modern Carbohydrate Chemistry**

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**Lecture:** TR, 6:55-8:10 PM; B451 Benton Hall

**Office Hours:** TR, 5:00-6:45 PM or by appointment

**Textbook/Supplies:** Robert V. Stick “Carbohydrates: The Sweet Molecules of Life”, Academic Press, 2001; *a set of Molecular Models is recommended* (both are available at the University Book Store)

Credit: 3.0

Ref#: 26540

CHEMISTRY 469 is the lecture course that welcomes you to the exciting world of carbohydrate chemistry, the chemistry of living tissue, the science that covers multiple aspects of modern organic, synthetic, medicinal, pharmaceutical, bio-, and computational chemistry.

For many years carbohydrates had been ignored by both pharmaceutical industry and academia most likely due to underestimation of the biological activity of this class of natural compounds. Many of you are familiar with the role of carbohydrates as energy sources (sugar, cereal, potato, celery for nutrition or wood as a source of heat) or structural components (elasticity of joints, cell wall constituents). These early considerations have been slowly refocused to the fact that carbohydrates have other vital biological functions as well as tremendous therapeutic and diagnostic potential!

It appears that complex carbohydrates (oligosaccharides, glycoconjugates) are involved in most cell functions: they give shape to cells and therefore organs, they identify cells by providing unique chemicals (antigens) on cell surfaces. Carbohydrates act both as receptors for signals from outside the cell and as signals for themselves, they also provide the energy reserves and currency of cells. As these processes are understood and mastered, and the structures of complex carbohydrates are elucidated, some diseases will be conquered and clinical therapies invented or improved (examples: outer shell of the AIDS virus is covered with carbohydrates, many types of tumor cells produce unusual carbohydrate sequences, skin disorders, various infections *etc., etc., etc.*).

During the lecture course you will not only learn major tools that allow chemists to synthesize or modify carbohydrate molecules, but also design the multi-step syntheses of complex natural carbohydrates. You will also have an opportunity to define novel carbohydrate structures responsible for some kind of a biological/medical process/disorder, plan their synthesis, tell your colleagues about your findings, as well as defend your work in a real world atmosphere.

## Syllabus - CHEMISTRY 469, WINTER 2002

(subject to modification)

- Lecture #1-3.            January 15,17,22  
*Introductory aspects of the subject (occurrence, nomenclature, biological roles, therapeutic potential)*
- Lecture #4-6.            January 24,29,31  
*Protecting groups (classes, strategies, applications)*
- Lecture #7,8.            February 5,7  
*Reactions at the anomeric center*
- Lecture #9-14.          February 12,14,19,21,26,28  
*Formation of a glycosidic linkage (methods, approaches, principles)*
- Lecture #15-20.        March 5,7,12,14,19,21  
*Oligosaccharide synthesis (strategies, conditions, applications)*
- Lecture #21,22.        April 2,4  
*Enzymatic synthesis*
- Lecture #23,24.        April 9,11  
*Carbohydrates as chiral synthons*
- Lecture #25.            April 16  
*Methods for carbohydrate analysis (NMR, mass-spectrometry, Dionex)*
- Lecture #26-28.        April 18,23,25  
*Glycoconjugates (types, classes, properties)*
- Lecture #29,30.        April 30, May 2  
*Student presentations*

All students are expected to attend lectures without exception. If you miss a lecture for any reason, make sure that you obtain notes from others. Final grade will be given based on attendance, in-class performance, homework and a presentation.

Good luck with your studies!