

# Chemistry 129

## Understanding Molecules and Medicine – Spring 2015

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### Contact Information:

**Professor:** Emily McLaughlin  
**Office:** RKC 136  
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**Time and Place:** Class/Lab meets Wednesdays from 8:00 am – 10:00 am in RKC 102/126  
and Fridays from 8:00 am – 11:00 am in RKC 102/126

**Office Hours:** Wednesdays and Thursdays from 3-4pm, and *by appointment*

### Suggested Materials (for background reading – most other sources will be available on Moodle):

1. *Laughing Gas, Viagra, and Lipitor: The Human Stories behind the Drugs We Use*  
by Jie Jack Li ISBN: 9780195300994
2. *Molecules and Medicine*, by EJ Corey, Barbara Czako, and Lazlo Kurti  
ISBN: 978-0470227497
3. *The Disappearing Spoon*, by Sam Kean ISBN: 978-0316051637
4. *Napoleon's Buttons: How 17 Molecules Changed History*  
ISBN: 978-1585422203

**REQUIRED FOR THE LAB:** Experimental data must be recorded in a bound notebook (such as a composition notebook). This will be checked periodically for content and organization.

**Website:** Most materials for our course can be found at [moodle2.bard.edu](http://moodle2.bard.edu). You will need a password to join the class website. Pertinent course documents are posted on Moodle, experimental procedures, reading from the primary literature, and links to useful websites.

*The password is: **peptideS15***

**Course Overview:** This course is designed to explore the chemistry of certain medicinal chemicals and how they affect the mind and body. We will gain a solid foundation in structure, bonding, and chemical space of (mostly) organic molecules and use this knowledge to understand bioactivity while also discussing the implications of the development of drugs in a social context (drug development, funding, clinical trials, etc.). The laboratory component of the class provides an integral experience and an alternative way for you to explore science and scientific data sets using hands-on activities. These experiments will make use of quantitative as well as qualitative reasoning while using a logical approach toward problem solving.

### Course Goals:

- To gain appreciation, experience, and competence in quantitative reasoning within the context of experimental design (inquiry) and the evaluation of scientific data (analysis).
- To acquire an understanding of the perspectives that influence scientific research as it relates to chemistry, drug development, and therapeutic marketing.
- To develop written and oral skills for communicating analytical data/scientific theories.

**Grading in the course:** This grading for this course is weighted and outlined below.

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|--------------------------------------|-----|
| • Class attendance and participation | 10% |
| • Laboratory                         | 25% |
| • Independent and Team Projects      | 35% |
| • Midterm Exam                       | 20% |
| • Final Assessment                   | 10% |

**Class attendance and participation:** Regular attendance and participation in this class is the best way to grasp the concepts and principles being discussed (and is directly influences 10% of your grade in this course). *If you are late or absent, it is your responsibility to contact the instructor to find out what you missed and to complete any overdue work.*

**Laboratory:** Lab reports/worksheets will be assigned during or after completion of the experiment. Many of experiments will be completed over multiple weeks. The guidelines and due dates for assignments will be announced and posted on the moodle2 website.

**Independent Projects:** Two independent “case-study” type projects will be assigned. These guided assignments are related closely to course material and are designed to exercise your analytical and critical thinking skills while providing an opportunity to practice these skills through writing.

**Team Project:** Throughout the semester, you will work in small groups (3-4 students) to tackle one larger project. This project will culminate in a brief oral presentation and written analysis/solution to the Thalidomide case study. You will be provided with opportunities to present drafts to your instructor as the semester progresses.

**Midterm Exam:** One midterm examination will include problem solving and questions based on material covered throughout the semester. Be sure to take good notes and work homework problems when they are assigned. Guidelines for the midterm will be posted on the moodle2 website one week before the exam (tentatively scheduled for March 13<sup>th</sup>).

**Final Assessment:** During the final class meeting, you are required to participate in an in-class individual assessment wherein you will be presented one final case study. More details will follow.

*Note: College policies and penalties (see the Bard College Student Handbook) regarding plagiarism and academic dishonesty will be strictly enforced in this course.*

### Course Outline (suggested topics and dates)

January 28 <sup>th</sup> and 30 <sup>th</sup>	Course Introduction Discussion on Thalidomide LAB: Structure and Bonding - Molecular Models
February 4 <sup>th</sup> and 6 <sup>th</sup>	More on molecular structure LAB: Stereochemistry and Chirality of Drugs
February 11 <sup>th</sup> and 13 <sup>th</sup>	Amino acids, peptides, and proteins LAB: Natural product extraction
February 18 <sup>th</sup> and 20 <sup>th</sup>	Historical perspective on drug discovery LAB: Natural product purification, quantification, and analysis
February 25 <sup>th</sup> and 27 <sup>th</sup>	Guest speaker: Drug monitoring and safety LAB: Quantification and analysis of extract oil/commercial oil
March 4 <sup>th</sup> and 6 <sup>th</sup>	Drug Safety, dosing, and regulations LAB: Thalidomide and Catnip: structural changes in basic solution
March 11 <sup>th</sup> and 13 <sup>th</sup>	Midterm Exam Group Project Meetings
March 14 <sup>th</sup> -22 <sup>nd</sup>	<i>SPRING BREAK – no classes</i>
March 25 <sup>th</sup> and 27 <sup>th</sup>	Alkaloids: Caffeine and other stimulants LAB: Caffeine content in your favorite beverages
April 1 <sup>st</sup> and 3 <sup>rd</sup>	Other important and not-so-important alkaloids LAB: Caffeine content in your favorite beverages
April 8 <sup>th</sup> and 10 <sup>th</sup>	Quinine and anti-malarial drugs LAB: Determination of quinine in tonic water
April 15 <sup>th</sup> and 17 <sup>th</sup>	DNA (central dogma) and antivirals LAB: Determination of quinine in tonic water
April 22 <sup>nd</sup> and 24 <sup>th</sup>	Anti-Inflammatory agents and Analgesics LAB: Analysis of Drug Components by Liquid Chromatography
April 29 <sup>th</sup> and May 1 <sup>st</sup>	Anti-Inflammatory agents and Analgesics LAB: Analysis of Drug Components by Liquid Chromatography
May 6 <sup>th</sup> and May 8 <sup>th</sup>	Special Topics - TBA Team Project work - Thalidomide
May 13 <sup>th</sup> and May 15 <sup>th</sup>	Completion Days – In class final assessment and Team Projects due