J. A. Porco, Jr.: Brief Biosketch

- Ph.D. Harvard University (1992)
- Joined the Department of Chemistry at Boston University as Assistant Professor (1999)
- Confounded Center for Chemical Methodology and Library Development at Boston University (CMLD-BU, 2002)
- Promoted to Professor of Chemistry (2004)
CH203 AA Logistics

• **Instructor:** Professor John A. Porco, Jr.
• **Office:** Life Sciences and Engineering Building (LSEB) 802
• **Office telephone:** 353-2493
• **E-mail:** porco@bu.edu
• **Class Location and Meeting Times:** Tuesday-Thursday 8:00-9:20 am, STO B50.
• **Office hours:** Mondays 1-2 PM and Wednesdays 4-5 pm in LSEB 802 or by appointment. Please come at the beginning of the office hour. I will also hang around the class for a few minutes afterwards to answer questions.
Lecture Textbooks and Other Course Material

- **Organic Chemistry** 7th Edition by John McMurry (Brooks/Cole)
- **Study Guide and Solutions Manual** (Sixth Edition) by Susan McMurry.
- "Pushing Electrons: A guide for students of organic chemistry (Weeks) is very helpful but not required"
- **Molecular Models** are also extremely useful and a variety of types are available in the bookstore. Many sets are likely also available from former organic chemistry students.
CH203 Objectives

- Develop an appreciation of organic structure and organic substances
- Use a functional group approach to organic chemistry, chemical reactions, and synthetic transformations
- Come to an understanding of how chemical reactions occur and how reaction mechanisms may be deduced
- Achieve Personal Goals
- Have Fun with it!
CH203 Course Website

CH 203 AA - Fall 2009

Course Syllabus
Lecture Notes
Handouts
Exams
Links
Contact Info

Disclaimer

http://people.bu.edu/porcogrp/CH203/CH203.htm
Meet the

CH203

AA Class!
Discussions will begin the week of September 8th and will be led by Bruno Rubio and Joseph Tucker:

CH203 A0 Monday 12:00 – 1:00 pm SCI 111 (BR)
CH203 A1 Monday 1:00 – 2:00 pm SCI 111 (BR)
CH203 A2 Monday 2:00 – 3:00 pm SOC B59 (JT)
CH203 A3 Monday 3:00 – 4:00 pm SOC B57 (JT)
CH203 A4 Tuesday 9:30 – 10:30 am CAS 312 (BR)
CH203 A5 Tuesday 5:00 – 6:00 pm SCI 111 (JT)
CH203 A6 Wednesday 2:00 – 3:00 pm BRB 122 (JT)
CH203 A7 Wednesday 3:00 – 4:00 pm CAS 223 (JT)
CH203 A8 Wednesday 4:00 – 5:00 pm SCI 113 (BR)
CH203 A9 Thursday 12:00 – 1:00 pm SOC B57 (BR)
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<tr>
<th>Total Points</th>
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<tr>
<td>&gt;368</td>
<td>&gt;92</td>
<td>A</td>
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<tr>
<td>352&lt;368</td>
<td>88-92</td>
<td>A-</td>
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<tr>
<td>340&lt;352</td>
<td>85-88</td>
<td>B+</td>
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<tr>
<td>324&lt;340</td>
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<td>312&lt;324</td>
<td>78-81</td>
<td>B-</td>
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<tr>
<td>288&lt;312</td>
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<td>&lt;200</td>
<td>&lt;50</td>
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The final grades will be based on 400 points (300 points for examinations and 100 points for the laboratory)
CH203 AA Exams

There will be three (3) ‘in-class’ examinations during the semester (1.5 h) and a final examination (2 h).

There are no "make-up" exams

If the median grade of an examination is less than 75%, the median grade will be raised to a 75% by adding a constant amount (not more than 20%, however) to the grade of each student. If the median grade is greater than 75%, the grades will not be changed.

You may drop one of the “in class” examinations for any reason, but not the final examination.

Each examination is worth 100 pts.

Dates of Examinations:
October 1 (Thurs.), November 5 (Thurs.), and December 3 (Thurs.)
(Location: STO B50 and other rooms).

Final Exam:
December 17, 2008 12:30-2:30 pm. Locations: TBD

http://www.bu.edu/cas/undergraduate/conductcode.html
Other Helpful Hints:

1) Attend the Lecture!

2) Keep up with the material

3) Review and rewrite your lecture notes after every lecture

4) Prepare notecards for key concepts and reactions/mechanisms

5) Form study groups (maximum of four students)

6) Find problems at the end of the chapter that correspond to the lecture material

7) Don't cram for exams
Tentative Schedule of Topics from McMurry (7th Edition)

Chapter 1: Structure and Bonding
Chapter 2: Polar Covalent Bonds; Acids and Bases
Chapter 3: Organic Compounds: Alkanes and Their Stereochemistry
Chapter 4: Organic Compounds: Cycloalkanes and Their Stereochemistry
Chapter 5: An Overview of Organic Reactions
Chapter 6: Alkenes: Structure and Reactivity
Chapter 7: Alkenes: Reactions and Synthesis
Chapter 8: Alkynes: An Introduction to Organic Synthesis
Chapter 9: Stereochemistry
Chapter 10: Organohalides
Chapter 11: Reactions of Alkyl Halides: Nucleophilic Substitutions and Eliminations
Chapter 13: Structure Determination: Nuclear Magnetic Resonance Spectroscopy

Assigned problems for each chapter will be provided in lecture
Examples of Organic Molecules as Drugs

Penicillin (antibiotic)

caffeine (stimulant)
Carbon Compounds are Central to Life As We Know It

1) DNA

2) Amino Acids - Proteins
The Crystal Lattice of Diamond
Representations of Orbitals

An s orbital

A p orbital

A d orbital

A 2p orbital

Electron cloud plots
A $2p_x$ orbital

A $2p_y$ orbital

A $2p_z$ orbital

Three $2p$ orbitals
<table>
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<th>Capacity</th>
<th>Electrons</th>
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<tr>
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<td>capacity—2 electrons</td>
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</tr>
<tr>
<td>2nd shell</td>
<td>capacity—8 electrons</td>
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<tr>
<td>3rd shell</td>
<td>capacity—18 electrons</td>
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<table>
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<th>Electrons</th>
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<tr>
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<td>3p</td>
<td></td>
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<tr>
<td>3d</td>
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Chapter 1
Structure and Bonding

Organic Chemistry: Chemistry of Compounds of Carbon (C)

1) C atomic # 6, second row group 4. A element

2) can share 4 valence e-5 as we will see.

We live in an age of organic:
- clothing (e.g. nylon - synthetic polymer
- gasoline 5-12 carbons

\[ \text{CH}_3 - \text{C} - \text{CH}_2 - \text{C} - \text{CH}_3 \]

2,2,4-trimethylpentane isomer
Structure & Bonding

1. Atomic Orbitals

Orbital: A region of space where the probability of finding an e\(^-\) is large (e\(^-\) spends 90-95% of its time)

- s and p orbitals most important in the formation of organic molecules

- Orbitals are organized into different layers or "shells"

   
   \[
   \begin{array}{c|c|c|c}
   \text{Energy} & 1s & 2s & 2p \\
   \text{Electrons} & 2 & 2 & 6. \ldots \\
   \end{array}
   \]

   - d orbitals

   - e\(^-\) shells:
     - s, p, d, f
     - successively larger size
P orbitals

- oriented in space along mutually perpendicular directions
- \( p_x, p_y, p_z \)
- dumbbell shaped
- two lobes separated by node (zero density)
Ex electronic configurations of some elements

1) Carbon
   (atom # 6)
   2p 1 1
   2s 1
   1s 1

2) Oxygen
   (atom # 8)
   2p 1
   2s 1
   1s 1

Follow these rules to arrive at the electronic configuration of any atom:

A. The Aufbau principle: orbitals are filled so that those of lower E are filled 1st. (aufbau = german for "building up"

B. The Pauli Exclusion principle: A max of 2 e- may be placed in each orbital and each must be of opposite spin (↑ + ↓)

C. Hund's Rule: When we come to orbitals of equal energy (= degenerate) e.g. p orbitals, add one e- with their spins unpaired until all orbitals are half full

Take the problem: N + F

Every orbital in a subshell is singly occupied with one e- before any one orbital is double occupied
Chapter 1  Problems

CH 203 AA  09

4, 10-13, 23, 25, 26

28-31, 33, 35, 46-50, 56