First attempts at TopHat

Are you male or female?

A. Male

B. Female
First attempts at TopHat

Have you taken Chem 233 (i.e., Organic Chemistry I) previously?

A. Yes
B. No
First attempts at TopHat

What is your name?
What was your grade in Chem 116 (or the equivalent)?

A. “A”
B. “B”
C. “C”
D. “D”
E. “F”
F. “I”
G. I haven’t taken the course yet.
What was your grade in Organic I (i.e., Chem 233)?

A. “A”
B. “B”
C. “C”
D. “D”
E. “F”
F. “I”
First attempts at TopHat

Have you taken Chem 234 (i.e., Organic Chemistry II) previously?

A. Yes
B. No
What is your expected grade in this course (i.e., Chem 234)?

A. “A”
B. “B”
C. “C”
D. “D”
E. “F”
F. “I”
What is your professional goal? Why are you taking this course?

A. Biology Graduate School
B. Biochemistry
C. Chemical Engineer
D. Chemist
E. Environmental Science
F. Forensic Science
G. Law
H. Medical Doctor
I. Nutritionist
J. Optometrist
K. Pharmacist
L. Physical Therapy
M. Teaching
N. Veterinarian
O. Haven’t Decided Yet
How to Make an Appointment

• Google “John Penn WVU” and take the very first hit
• Follow the link for making an appointment
• DO NOT SELECT a time on Saturday or Sunday
• In class demo
<table>
<thead>
<tr>
<th>Homework Assignment</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>B4-11-01 IR Functional Groups (wDeadline)</td>
<td>Tuesday, August 23</td>
</tr>
<tr>
<td>B7-14-02 Mass Spec - Molecular Ion (wDeadline)</td>
<td>Wednesday, August 24</td>
</tr>
<tr>
<td>B7-14-03 Mass Spec - Isotope Effects (wDeadline)</td>
<td>Thursday, August 25</td>
</tr>
<tr>
<td>B7-15-01 Number of Peaks 1H NMR Spectra (wDeadline)</td>
<td>Friday, August 26</td>
</tr>
<tr>
<td>B7-15-06 Number of Peaks 13C NMR (wDeadline)</td>
<td>Saturday, August 27</td>
</tr>
<tr>
<td>B7-15-02 Theoretical NMR Chemical Shift (wDeadline)</td>
<td>Sunday, August 28</td>
</tr>
<tr>
<td>B7-15-03 Theoretical NMR Integration (wDeadline)</td>
<td>Monday, August 29</td>
</tr>
<tr>
<td>B7-15-04 Theor. NMR Spin-Spin Splitting (wDeadline)</td>
<td>Tuesday, August 30</td>
</tr>
<tr>
<td>B7-15-05 NMR Spectroscopy Problems (wDeadline)</td>
<td>Wednesday, August 31</td>
</tr>
<tr>
<td>B7-15-07 13C NMR Structure ID (wDeadline)</td>
<td>Thursday, September 1</td>
</tr>
<tr>
<td>B7-13-01A Nomenclature Alkyl Halides (wDeadline)</td>
<td>Friday, September 2</td>
</tr>
<tr>
<td>B7-13-01B Alkyl Halide Nomenclature (wDeadline)</td>
<td>Saturday, September 3</td>
</tr>
<tr>
<td>B7-13-02A Halogenation of Alkanes (wDeadline)</td>
<td>Sunday, September 4</td>
</tr>
<tr>
<td>B7-13-02B Halogenation of Alkanes (wDeadline)</td>
<td>Monday, September 5</td>
</tr>
</tbody>
</table>
## Order of Coverage (Exam 1)

<table>
<thead>
<tr>
<th>Homework Assignment</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>B7-13-03A Oxidation and Anti-oxidants (wDeadline)</td>
<td>Tuesday, September 6</td>
</tr>
<tr>
<td>B7-19-01 Aromaticity (wDeadline)</td>
<td>Wednesday, September 7</td>
</tr>
<tr>
<td>B7-19-02B Arene Nomenclature (wDeadline)</td>
<td>Thursday, September 8</td>
</tr>
<tr>
<td>B7-19-03A Halogenation of Arenes (wDeadline)</td>
<td>Friday, September 9</td>
</tr>
<tr>
<td>B7-19-03B Halogenation of Arenes (wDeadline)</td>
<td>Friday, September 9</td>
</tr>
<tr>
<td>B7-19-04A Arene Rxns Inorganic Acids (wDeadline)</td>
<td>Saturday, September 10</td>
</tr>
<tr>
<td>B7-19-04B Arene Rxns Inorganic Acids (wDeadline)</td>
<td>Saturday, September 10</td>
</tr>
<tr>
<td>B7-19-05A Friedel-Crafts (wDeadline)</td>
<td>Sunday, September 11</td>
</tr>
<tr>
<td>B7-19-05B Friedel-Crafts (wDeadline)</td>
<td>Sunday, September 11</td>
</tr>
<tr>
<td>B7-19-06 Arene Mechanistic Issues (wDeadline)</td>
<td>Wednesday, September 12</td>
</tr>
<tr>
<td>B7-19-06B Arene Mechanisms (wDeadline)</td>
<td>Wednesday, September 12</td>
</tr>
<tr>
<td>B7-19-07A Nucleophilic Aromatic Subs (wDeadline)</td>
<td>Thursday, September 13</td>
</tr>
<tr>
<td>B7-19-07B Nucleophilic Aromatic Subs (wDeadline)</td>
<td>Friday, September 14</td>
</tr>
<tr>
<td><strong>Exam 1</strong></td>
<td><strong>September 18, 19, 20</strong></td>
</tr>
</tbody>
</table>
# Teaching

## Fall 2016

### Chem 234

<table>
<thead>
<tr>
<th>Exam 1</th>
<th>Exam 2</th>
<th>Exam 3</th>
<th>Exam 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>TBD @ Soc/Anthro Testing Center</td>
<td>TBD @ Soc/Anthro Testing Center</td>
<td>TBD @ Soc/Anthro Testing Center</td>
<td>TBD @ Soc/Anthro Testing Center</td>
</tr>
</tbody>
</table>

### Lecture Notes

- Wednesday, August 17
- Friday, August 19
- Monday, August 22
- Wednesday, August 24
- Friday, August 26
- Monday, August 29
- Wednesday, August 31
- Friday, September 3
- Monday, September 5 - No Class (Labor Day)
- Wednesday, September 7
- Friday, September 9
- Monday, September 11
- Wednesday, September 13
- Friday, September 15
- Monday, September 18
- Wednesday, September 20
- Friday, September 22
- Monday, September 25
- Wednesday, September 27
- Friday, September 29
- Monday, October 2
- Wednesday, October 4
- Friday, October 6
- Monday, October 9
- Wednesday, October 11
- Friday, October 13
- Monday, October 16
- Wednesday, October 18
- Friday, October 20
- Monday, October 23
- Wednesday, October 25
- Friday, October 27
- Monday, October 30
- Wednesday, November 1
- Friday, November 3
- Monday, November 6
- Wednesday, November 8
- Friday, November 10
- Monday, November 13
- Wednesday, November 15
- Friday, November 17
- Monday, November 20
- Wednesday, November 22
- Friday, November 24
- Monday, November 27
- Wednesday, November 29
- Friday, December 1
- Monday, December 4
- Wednesday, December 6
- Friday, December 8
- Monday, December 11
- Wednesday, December 13
- Friday, December 15
- Monday, December 18
- Wednesday, December 20
- Friday, December 22
- Monday, December 25
- Wednesday, December 27
- Friday, December 29
- Monday, December 30

### Lecture Notes (Subject to Change)

- Friday, September 16
- Monday, September 19
- Wednesday, September 21
- Friday, September 23
- Monday, September 26
- Wednesday, September 28
- Friday, September 30
- Monday, October 3
- Wednesday, October 5
- Friday, October 7
- Monday, October 10
- Friday, October 14
- Monday, October 17
- Wednesday, October 19
- Friday, October 21
- Monday, October 24
- Wednesday, October 26
- Friday, October 28
- Monday, October 31
- Wednesday, November 2
- Friday, November 4
- Monday, November 7
- Wednesday, November 9
- Friday, November 11
- Monday, November 14
- Wednesday, November 16
- Friday, November 18
- Monday, November 21
- Wednesday, November 23
- Friday, December 1
- Monday, December 2

### Assigned Homework

- Class Syllabus
- WE LEARN System

---

Scroll down for more information, as can be seen on the next slide.
Electromagnetic Spectrum

- $f = \frac{c}{\lambda}$
  or
- $f = \frac{E}{h}$
  or
- $E = \frac{hc}{\lambda}$
- Where $c$ is the speed of light
- And $h$ is Planck’s constant
Visualization of Vibrations

All links on this page accessed on 8/18/2016

• CH2Cl2
  – IRmodes.html

• Dichloroethene
  – demos/DCE.html

• H2O, CO2, and Adamantane
  – chemtube3d

• Quite a few molecules
  – demos/
Cyclohexane

Finger print region

C-H Stretches
1-Propanol

\[ \text{OH Stretch} \]
Propanenitrile

$\text{CN} \text{Stretch}$
Cyclohexanone

C=O Stretch
Heptanoic acid

\[ \text{C=O Stretch} \]

\[ \text{OH Stretch} \]
Ethanoic acid

![Ethanoic acid molecule]

[Graph showing infrared spectrum with labeled peaks at 4000 cm⁻¹ to 500 cm⁻¹. Peaks are labeled as OH Stretch and C=O Stretch.]
2-Methylpentanal

C-H of the aldehyde, Exactly 2750 cm\(^{-1}\)

C=O Stretch
Methyl Ethanoate

![Methyl Ethanoate IR Spectrum](image)

- **C=O Stretch** at 1740 cm⁻¹
- **CO Stretch** at 1150 cm⁻¹
Interpreting IR Spectra

Major Functional Groups

- Alcohol 3400-3600 cm\(^{-1}\)
- Nitrile 2220-2260 cm\(^{-1}\)
- Amine 3200-3400 cm\(^{-1}\)
- Carbonyl Group 1650-1780 cm\(^{-1}\)
- OH group 3400-3600 cm\(^{-1}\)
  - Broad
- Carboxylic Acid
- C-H Shoulder
  - Exactly 2750 cm\(^{-1}\)
- Aldehyde
- C-O Stretch
  - 1050-1250 cm\(^{-1}\)

No Other Features
- Ketone

This will be given to you during any exam.
What functional groups?

A. Alcohol
B. Nitrile
C. Amine
D. Carboxylic Acid
E. Aldehyde
F. Ester
G. Ketone

2010-08-19 Q2 cm$^{-1}$
What functional groups?

A. Alcohol
B. Nitrile
C. Amine
D. Carboxylic Acid
E. Aldehyde
F. Ester
G. Ketone

C=O Stretch
C-H of the aldehyde, Exactly 2750 cm\(^{-1}\)

2016-08-19 Q3
What functional groups?

A. Alcohol
B. Nitrile
C. Amine
D. Carboxylic Acid
E. Aldehyde
F. Ester
G. Ketone

C=O Stretch

2016-08-19 Q4
What functional groups?

A. Alcohol
B. Nitrile
C. Amine
D. Carboxylic Acid
E. Aldehyde
F. Ester
G. Ketone

2016-08-19 Q5