The Chemistry of Wine (Chemistry 0821)  
The Fall of 2018  
A General Education Class for the College of Science and Technology

Instructor: Robert-André F. Rarig, Ph. D. rarig@temple.edu
Lecture: Mondays, Wednesdays, and Fridays; 9:00-9:50 AM in Beury 166

Lab / Recitation instructors:  
Mondays (11:00-11:50 AM):  
Tuesdays (10:00-10:50 AM):  
Wednesday (10:00-10:50 AM):  
Wednesday (1:00-1:50 PM):  
Thursday (2:00-2:50 PM):  
Friday (1:00-1:50 PM):

Office hours: Robert Rarig (202 Beury) Wednesdays & Fridays: 10:00-11:30 or by appointment

Course materials: please buy a stapler if you don’t own one.
1) Assorted readings that will be made available for you on Canvas
2) TOP HAT membership— you will receive an email with instructions to follow. (Join Code: 923850)
4) “Chemical Principles” (3rd Edition) By Richard E. Dickerson, Harry B. Gray, and Gilbert P. Haight Available for free from Caltech: http://authors.library.caltech.edu/25050/

Description: A large percentage of chemists appreciate wine. The goal of this course is to increase the percentage of wine enthusiasts who appreciate chemistry. On an introductory level, this course will address:
1) How to make wine.
2) The biochemical and mechanical aspects of growing and harvesting grapes
3) How fermentation and other chemical processes turn grape juice that is worth $4 a gallon into wine that is potentially worth hundreds of dollars a bottle.
4) The chemical composition of Red Wine vs. White Wine
5) The science of sight, taste, and scent.
6) Accessing scientific literature / proper acknowledgment / avoiding plagiarism
7) How scientists emulate nature.
8) The scientific method
9) The basic fundamentals of chemical structure
10) How forensic science is based in chemistry and how it is applied to wine quality control

Most lectures are accompanied with demonstrations to illustrate practical applications of the topics being discussed. A lot of concepts will be reinforced in laboratory activities during the recitation times.
<table>
<thead>
<tr>
<th>Dates</th>
<th>Topics</th>
<th>Important events</th>
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<tbody>
<tr>
<td>Aug 27-31</td>
<td>Syllabus, The Process of Wine Making; The Periodic Table; The Atom</td>
<td>No Class on Sep 3rd (Labor Day)</td>
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<td>Searching for Scientific Information</td>
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<tr>
<td>Sep 4-7</td>
<td>The Two Major Chemical Components of Wine</td>
<td>September 10th is the last day to drop a course</td>
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<td>Atomic Size, Chemical Bonding, Ions vs Dipoles</td>
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<td>Sep 10-14</td>
<td>Fermentation: how Sugars are Converted into Ethanol; Density &amp; Buoyancy;</td>
<td>Extra credit movie</td>
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<td>Sep 17-21</td>
<td>The Law of Conservation of Mass</td>
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<td>Sep 24-28</td>
<td>pH, Acidity; Functional Groups</td>
<td>Extra credit movie &amp; Exam Q &amp; A Sep 29th</td>
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<td>Ideal Grape-Growing Conditions</td>
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<td>Oct 1-5</td>
<td>Wine Oxidation; Malolactic Fermentation</td>
<td>Exam 1 Oct 1st</td>
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<td>Oct 8-12</td>
<td>The Energy of Wine and Chemistry: Kinetics &amp; Thermodynamics</td>
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<td>Oct 15-19</td>
<td>The Electromagnetic Spectrum; Sight: Light, Colors, Conjugation</td>
<td>Oct 23rd is the last day to withdraw from a course!</td>
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<td>Oct 22-26</td>
<td>Analysis: Spectroscopy &amp; Spectrometry</td>
<td>Take-Home Lab: Spartan</td>
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<td>Oct 29- Nov 2</td>
<td>Like Dissolves Like Separations: Distillation &amp; Chromatography</td>
<td>Extra Credit Movie &amp; Exam Q&amp;A Nov 3rd</td>
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<td>Nov 5-9</td>
<td>Tannin Polymerization; Amino Acids, Proteins;</td>
<td>Exam 2 Nov 5th</td>
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<td>Nov 12-16</td>
<td>Taste: G-coupled Protein Receptors &amp; Ion Channels;</td>
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<td>Nov 19-23</td>
<td>No Class</td>
<td>Fall/Thanksgiving Break</td>
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<td>Nov 26-30</td>
<td>Student Presentations</td>
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<td>Dec 3-7</td>
<td>Student Presentations</td>
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<td>Dec 10</td>
<td>Student Presentations</td>
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<td>Wednesday, Dec 20</td>
<td>10:30 AM – 12:30 PM (our normal room)</td>
<td>Final Exam</td>
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**Grading:** Your course grade will be based on your performance on:

In-Class Questions (TOP HAT)……………………………………………………………………(50 points)
Recitation & Lab participation (including 4-pre-labs)……………………………………..(300 points)
1 team presentation (see the list of possible topics below)……………………………..(150 points)
2 midterm examinations………………………………………………………………………..(250 points)
a final examination……………………………………………………………………………….(250 points)
There will also be...

**Extra credit opportunities:** movie viewings (10 points each; 2 max), designing a Temple wine label (10 points), Reading Questions (20 pts), and 3 post labs (10 points each).

**Grading cutoffs:** The worst grade you can earn with the following course percentages are as follows: 100%-90% (A-); 89%-80% (B-); 79%-70% (C-); 69%-60% (D); <60% (F).

**Team Presentation Topics:**
1. Effects of alcohol on the brain
2. Effects of alcohol on sleep.
3. Terroir – Soil
4. Determining alcohol content
5. When you are under the influence
6. Fortified wines
7. Terroir – Microclimate
8. Counterfeit wines
9. Malolactic Fermentation
10. Detecting blood alcohol levels
11. Does coffee help with DUI
12. Ice wine
13. Corked wine
14. Plastic vs. cork vs. screw top
15. Champagne
16. Clear vs. Colored bottles; Why so many green bottles?
17. Wine and cardiovascular disease
18. Does eating before/while drinking affect blood alcohol levels?
19. Pregnancy and wine/alcohol
20. Yeast strains vs. wine quality
21. Why the legal drinking age is 21.
22. Why the legal drinking age could be 18.
23. The Chemistry of Oak-Barrel Ageing

**Policies on Accepting Work:**
- Pre-Labs are due at the beginning of your recitation session during lab weeks. Late Pre-Labs won’t be accepted.
- Post-Lab extra credit (due 1 week after each lab) will not be available to anyone who did not attend the corresponding lab. Late post-labs will not be accepted.
- Any other assignment will lose 10% of its value for every day it is late. This includes weekend days.
- Any work submitted by email or to my mailbox will not be graded. You may email an image before a due date to prove it’s been done, but only hard copies will be graded. Adjustments may not be made after the picture is submitted.
- Work submitted without a name will receive no credit.

**Staple Policy:**
Anyone who brings a stapler to recitation in week two of the semester gets 10 extra credit points. Any unstapled work that is handed in throughout the semester will automatically lose 2% of the assignment’s total value.

**Accounting for Improvement:**
If **a)** your attendance record is solid, **b)** you have handed in all course assignments on time, and **c)** you have taken both midterm exams, then your final exam percentage can replace a lower score on one of your midterm exams.
Course Resources

Lecture: MWF 12:00-12:50 AM. Please come! Attendance and participation will be monitored via Tophat interactions throughout each class.

Canvas: There will be a course Canvas site. Dr. Rarig will use this site to post a few slides from each lecture, reading assignments, homework assignments, answer keys, and grades.

Recitation/Laboratory Sessions (worth 30% of your grade): You will meet in smaller groups once a week to work on questions that will help you prepare for the exams, to develop your research skills for the end of semester presentations, and to conduct laboratory exercises. You will need to purchase a pair of safety goggles and fill out a laboratory safety form in order to be allowed into lab. These will be TA-run.

Problem sets: These will be covered in recitation, but they will also be made available on Canvas.

Text(s): See aforementioned “Course materials” section.

Library Site: http://guides.temple.edu/wine

Recitation instructor office hours: (see first page). Remember: office hours are NOT just for emergency situations!

Dr. Rarig: I have weekly office hours (see first page). Additionally, you are welcome to arrange a time to meet with me to discuss course content, your current performance, to solicit suggestions on improving your learning experience, or anything else pertaining to the Chemistry of Wine. Email is the best way to arrange such appointments.

Chemistry Department Calculator Policy (9/1/2008)

The use of programmable and/or graphing calculators on examinations or quizzes is strictly prohibited. The use of simple calculators (i.e. those without keyboards) is allowed only with the permission of the Instructor. The use of PDAs, cell phones, and electronic or paper dictionaries is strictly prohibited.
Laboratory Safety

Students are expected to conduct themselves as adults who are cognizant of their safety and the safety of those around them. Unauthorized experiments utilizing equipment and/or chemicals are not permitted. Participants in this course who are behaving inappropriately or unsafely will not be permitted to continue in the laboratory. Make-up of missed laboratory work will not be permitted. Although most of the chemicals used in this course are no more dangerous than those used in your home, students are required to come to class dressed properly.

- Eating and/or drinking in the laboratory are not permitted.

- Long pants or full-length skirts should be worn. Short pants, short skirts, and kilts are not permitted in the lab at any time. Arms should be covered to the elbow and midriffs should not be exposed. Clothing serves to provide an additional barrier which is important in a laboratory environment.

- Shoes/sneakers that cover the entire foot should be worn. Sandals, clogs, or open-toe shoes are not permitted in the lab at any time.

- **Laboratory participants must wear safety glasses or safety goggles** as soon as they enter the laboratory. We do not keep spare goggles to lend to students. It is the students’ responsibility to bring their goggles with them to the lab meeting. The wearing of contact lenses is not recommended. Contact lenses should, if possible, be replaced with eye-glasses worn behind safety goggles.

- Long hair must be tied back.

  **Improperly dressed students will not be permitted to work in the lab.**

Disability disclosure statement

Any student who has a need for accommodation based on the impact of a disability should contact me privately to discuss the specific situation as soon as possible. Contact Disability Resources and Services at 215-204-1280 in 100 Ritter Annex to coordinate reasonable accommodations for students with documented disabilities.
Temple Policy on Student and Faculty Academic Rights and Responsibilities

Freedom to teach and freedom to learn are inseparable facets of academic freedom. The University has adopted a policy on Student and Faculty Academic Rights and Responsibilities (Policy # 03.70.02) which can be accessed through the following address:

http://policies.temple.edu/getdoc.asp?policy_no=03.70.02

Important Registration Dates

Drop/Add: Without special approval from the instructor as long as the desired section(s) are open. Students should check the Diamond Line (215-204-2525) phone registration system frequently or Temple's On-line Course Schedule. Both systems will allow students to determine which sections are currently open. Note that a section that was closed in the early morning may have opened up by the afternoon, so check frequently.

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<th>Monday, September 10th</th>
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Withdrawal: Students may withdraw from the course without penalty (Grade of "W") any time up to Drop/Add deadline. After that grace period the "W" grade is only given in accordance with institutional procedure. The procedure to obtain a "W" grade after 12 September is governed by the Temple University Policy (#03.12.12) on Withdrawal.

<table>
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<th>Tuesday, October 23rd</th>
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<td>Last day to withdraw from graduate and undergraduate courses</td>
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Incomplete: Incomplete ("I") Grades will only be given in accord with Temple procedures. The "I" grade cannot be given until the specific requirements have been met and forms filled out, signed and submitted. This course is governed by the Temple University Policy (#03.12.13) on Incompletes. http://policies.temple.edu/getdoc.asp?policy_no=02.10.13

Make-up Exams

There will be no make-up exams except as explicitly designated by official written Temple policy.