

Chem. 201: Color, Light, & Chemistry
Spring 2018
Prof. Elizabeth J. Harbron

Instructor

Prof. Elizabeth J. Harbron, ISC 2047, ejharb@wm.edu (email is the best way to get in touch with me)

Class and Lab Meetings

Tuesdays 2 – 3:20 pm ISC 1111 (classroom)
Thursdays 2 – 3:20 pm ISC 1111
 3:30 – 4:50 pm ISC 2056 (lab)

Tuesday sessions will consist of discussions, lectures, student presentations, and demonstrations. Thursday sessions will combine these elements with hands-on lab activities.

Office Hours

Tuesdays 3:30 – 4:30 pm ISC 2047 (other hours are available by appointment, please email)

Required Course Materials

- Amy Butler Greenfield, *A Perfect Red*, ISBN: 9780060522766
- Chemical splash goggles must be worn during all labs. They may be purchased in the bookstore.
- *Other required readings will be distributed in class and/or on Blackboard*

Course Description

Color, Light, & Chemistry will use the theme of color and light to weave a narrative through basic concepts in chemistry. The course will be grounded in the Natural World and Quantitative Reasoning (NQR) domain as it explores the process of scientific discovery through reading, discussion, and hands-on experiments. Students will develop their understanding of the foundations of chemistry through the color and light theme. As a COLL 200 course, Color, Light, & Chemistry will also look outward to the Arts, Letters, and Values (ALV) domain by placing chemistry into the broader context of art, art history, and culture. Connections to the Cultures, Societies, and the Individual (CSI) domain will be made through discussions of dye industry, economics, artifact analysis, and world trade. This course will give students the opportunity to put methodologies represented in the course into practice through hands-on experiments, demonstrations, and a color story research project.

Assessment

30% Color story research project
20% Midterm exam
20% Final exam
15% Lab and homework worksheets
15% Participation (including in-class exercises)

Color story research project. You will complete a semester-long research project that focuses on a major discovery or application of color chemistry. Project milestones are set up throughout the semester to help you define and understand your topic as well as demonstrate the relevant chemistry in the lab. These milestones include proposing your research topic, planning and conducting a laboratory experiment, and designing an effective presentation with complementary visual aids. Projects will culminate in a group presentation that must teach the class some new chemistry (NQR) and integrate knowledge from the CSI and/or ALV domains. The overarching goals of the research project are to: 1) understand new chemistry through the lens of your color story and 2) make coherent and meaningful interconnections across the academic domains (NQR, CSI, and ALV) to create a compelling color story. Detailed information about the research project will be distributed in class and on Blackboard.

Exams. The midterm and final exam will test understanding of the scientific concepts presented in both the class and lab settings and are the primary means by which mastery of the basic ideas and methods of the NQR domain will be

assessed. Cultural and historical content from *A Perfect Red* and the Color Story portfolio presentations will also be covered on exams.

Labs. Labs enable you to put NQR methodologies represented in the course into practice. Labs will be accompanied by a worksheet on which you record observations and answer questions. Worksheets will typically be due at the end of the class period in which the experiment is conducted.

Homework. Three homework assignments that assist your preparation for class discussion of *A Perfect Red* will be given. It will be helpful for you to review the assignment prior to reading the designated book sections. Additional short homework assignments will be given throughout the course

Participation. Your engagement during class and lab is expected. Full participation includes coming to class and lab prepared, asking and answering questions, sharing in discussion, fully engaging in labs, working effectively with lab and project partners, delivering presentations, and completing in-class exercises.

Final Grades

The final class scores and grades will be scaled with the following considerations:

- A = Excellent performance and mastery of the material
- B = Very good understanding of the material
- C = Adequate performance
- D = Poor performance
- F = Unsatisfactory performance

Absence Policy

This course embraces an active learning environment in which full participation in group activities, in-class exercises, group presentations, labs, and discussions is vital to the learning experience. One class absence that results in a missed in-class exercise will be excused without penalty. Additional class absences resulting in a missed in-class exercise will result in a score of 0 for the exercise and a reduction in the participation grade. Late work will not generally be accepted. Due to the constraints of shared lab space, make-up labs are not possible. One absence from a lab for any reason will be excused without penalty. Additional lab absences will result in a score of 0 for the lab and a reduction in the participation grade. Students must complete 5 or more labs and all group experiments and presentations to pass the course. Any exceptions to these policies will be at the instructor's discretion in consultation with the Dean of Students Office (757-221-2510, deanofstudents@wm.edu).

Classroom Technology Policy

Every one of you contributes to the learning environment of this class through your presence, your questions and discussion points, and the energy you bring to the room. Technology can enhance the learning environment when you use it to seek additional information or document a lab experiment. However, technology can also distract you and those around you to the point that it destroys our carefully crafted learning environment. Accordingly, use of laptops, tablets, and phones for texting, social media, email, and web browsing unrelated to class is prohibited. Inappropriate use of technology will result in a reduction in the participation grade.

Honor Code

The student Honor Code is an important part of what makes W&M a special community. I expect you to observe the Honor Code fully and faithfully.

Accessibility

William & Mary accommodates students with disabilities in accordance with federal laws and university policy. Any student who feels s/he may need an accommodation based on the impact of a learning, psychiatric, physical, or chronic health diagnosis should contact Student Accessibility Services staff at 757-221-2509 or at sas@wm.edu to determine if accommodations are warranted and to obtain an official letter of accommodation.

Chem. 201 Class Schedule

| Dates | Topics | Readings | Lab Activities | Key Dates |
|---------------------|--|---|--|---|
| Jan. 19 | introductions LC: measuring light & color | OSP 24.3 | Lab 1: Exploring Light and Color | |
| Jan. 23 Jan. 25 | LC: additive color mixing, light-object interactions | PA p. 82-87, 92-97, 99-100, 103-106 | Lab 2: Additive Color Mixing (Tues.) Lab 3: Subtractive Color Mixing (Thurs.) | 1/26: add/drop period ends |
| Jan. 30 Feb. 1 | LC: subtractive color mixing MC: bridge to matter | PA p. 118-121, 125-127 | Intro to CS topics | 2/1: pigment timeline HW due |
| Feb. 6 Feb. 8 | MC: atoms – from color to bonding | OSC 2.3–2.5, 6.4, 7.1–7.3 APR prologue – Ch. 5 | Lab 4: Pigment Synthesis | 2/6: APR homework #1 due 2/8: CS topic rationales due |
| Feb. 13 Feb. 15 | MC: organic bonding, draw like a chemist | OSC 7.1 – 7.2 | CS Experiment #1 | |
| Feb. 20 Feb. 22 | chemistry review, MC: color and conjugation | OSC 7.4 APR Ch. 6 | Lab 5: Color and Conjugation | 2/22: APR homework #2 due 2/22: CS annotated bibliography due |
| Feb. 27 Mar. 1 | midterm exam CS: scientific method & experimental design | APR Ch. 10-12 | CS groups work on Experiment #2 design | 2/27: midterm exam 3/1: APR homework #3 due |
| SPRING BREAK | | | | |
| Mar. 13 Mar. 15 | MC: intermolecular interactions, organic functional groups | OSC 10.1 | Lab 6: Indigo Dyeing | 3/15: CS Experiment #2 plan due 3/16: last day to withdraw |
| Mar. 20 Mar. 22 | CS: presentation skills CS: sourcing workshop @ WRC, 3:30-4:50 pm | | sourcing workshop @ WRC | 3/22: presentation HW due |
| Mar. 27 Mar. 29 | CS: acid-base interactions, intro to fibers | OSC 14.1 | CS experiment #2 | 3/27: CS revised Expt #2 plan due (if necessary) 3/29: CS synopsis due |
| Apr. 3 Apr. 5 | CS: dye-fiber interactions, intro to fluorescence | | Lab 7: Dye-Fiber Interactions | |
| Apr. 10 Apr. 12 | CS: fluorescence applications | | | 4/12: CS slides due |
| Apr. 17 Apr. 19 | CS: scientific analysis of art | | CS presentation boot camp | |
| Apr. 24 Apr. 26 | CS: color story presentations | | CS presentations | 4/27: final CS slides uploaded by noon |
| May 3 | Final Exam on Thursday, May 3, at 2 pm | | | |

Abbreviations

LC: Light & Color MC: Matter & Color CS: Color Story WRC: Writing Resource Center
 OSP: *Open Stax College Physics*, Urone and Hinrichs, <https://openstax.org/details/books/college-physics>
 OSC: *Open Stax Chemistry*, Flowers, Theopold, and Langley, <https://openstax.org/details/books/chemistry>
 PA: *Physics in the Arts*, Gilbert and Haerberli
 APR: *A Perfect Red*, Butler Greenfield