Radiochemistry

CHEMISTRY 3200 / NUCLEAR ENGINEERING 3200

Spring Semester 2013

INSTRUCTOR: Professor Charles B. Grissom
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ADMINISTRATIVE ASSISTANT: Ms. TanDee Shaw
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LECTURES: 11:50 am – 1:40 pm MW 2006 HEB

TEXTBOOK: No textbook. All readings posted on CANVAS or distributed in class.
Optional readings will also be posted on CANVAS.

OFFICE HOURS: Office hours for Professor Grissom are Monday and Wednesday, 10:00-11:00 am in B-113 HEB and by appointment. I'm often available in my office at other times.

LABORATORY: This class includes 20 hours of hands-on laboratory training, experimentation, and field work during the semester. This includes: (1) radiation safety training by the University of Utah Office of Radiological Health, (2) three laboratory experiments, and (3) one-day of field work at radiochemistry-related sites near Moab, UT.

EXAMINATIONS: The class has two (2) midterms and one (1) final exam.

Dr. Grissom will only entertain questions of "Do we need to know this for the test?" "What is on the exam?" or "How many problems are there?" in class.

GRADES:

Midterm I	100 points
Midterm II	100 points
Completion of Radiation Safety Training	25 points
Laboratory Experiments	75 points
Homework	30 points
Final Exam	200 points
Total	530 points

WITHDRAWALS: Students may drop (delete) this class with no tuition penalty or permission until the date specified in the University of Utah Academic Calendar (the class will not appear on the students transcript). The end of the ninth week of the semester is the final day students can withdraw from this course (a "W" will appear on the students transcript and the student will be responsible for paying tuition for the class). After the end of the ninth week of the semester, students must file a petition with the Dean's office to withdraw from the course (The University's policy states that withdrawal will only be granted for "non-academic reasons beyond the student's control," i.e., "I want to avoid a bad grade" does not qualify).

INCOMPLETES: The official University policy regarding incomplete course work and assignment of the grade "I" will be followed: "The grade 'I' may be given for work not completed because of circumstances beyond the student's control, providing the student is passing the course and needs to complete 20% or less of the work required for the course." An UNEXCUSED absence at an exam cannot be used as a reason to get an "I" grade.

EQUAL OPPORTUNITY: The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodation in the class for a pre-determined, diagnosed, or recognized disability, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in alternative format with prior notification to the Center for Disability Services.

ACCOMODATIONS POLICY: Students should review the syllabus carefully to see if the topics covered in this course conflict with your sincerely-held core beliefs. If you have a concern, please discuss it with Professor Grissom at your earliest convenience (typically before the end of the first week of class).

AUDITING: To audit this course, you must be registered as an "audit" and you must attend all lectures, practicums, and take all exams. The exams will be graded and returned to you.

SNOW CLOSURE & EMERGENCIES: Dr. Grissom will be available by e-mail in the event of any snow closure. In the event of a personal emergency at the time of an exam you must call Professor Grissom at 581-4153.

TUTORING: Individual tutoring can sometimes be arranged through the University of Utah Tutoring Center in the Student Services Building, Room 330. Students are given a list of tutors to contact and schedule a day, evening, or weekend appointment. Low-income students may qualify for free tutoring. For more information call 581-5153 or visit www.saff.utah.edu/Tutoring/

CANVAS: Supplementary material for all lectures and laboratory practicums will be posted on CANVAS. Other interesting links will also be posted on the CANVAS site for the class. You must be registered for the class to access the information.

LABORATORY EXPERIMENTS:

Experiment 1: Liquid Scintillation Counting. In this experiment, you will determine the "apparent energy spectrum" for ^{3}H and ^{14}C by LSC methodology; learn to select energy windows coincidence gating parameters, and counting times; determine the relative amounts of ^{3}H and ^{14}C in a mixed sample of unknown activity; learn to correct for solvent-quenching, color-quenching, and chemiluminescence.

Field Work: Moab Tailings Pile Reclamation Tour and Uranium/Radium Collection. The class will meet in Moab at 9:00 am on a Saturday specified at the beginning of the course. You will receive a lecture about the process being utilized to move the uranium tailings pile and to sequester the radioactive tailings by methods that include geochemical immobilization. You will receive a tour of the Moab tailings pile reclamation site. The class will re-convene at a nearby site where you can see uranium-bearing rocks and soil that have been exposed by natural processes (not mining). You will select a 0.5 g sample of soil to analyze in lab.

Experiment 2: Alpha and Gamma Spectrometry of Rock/Soil Sample. Upon returning to the University of Utah, you will use α and γ spectrometry to determine the presence or absence of U, Ra, and ? in your sample.

Experiment 3: Analysis of Radon Daughters by LSC. In this experiment, you will collect the oldest "dust" that you can find in your house, apartment, dorm, flat, or dwelling (or a dwelling of another) and analyze the sample for the presence of radon daughters.

LECTURE SCHEDULE

Lecture	Day	Date	Lecturer	Topic	Reading Mat.
1	M	Jan. 7	Grissom	Fundamentals of Nuclear Decay	Handouts
2	W	Jan. 9	Grissom	Fundamentals of Nuclear Decay	Handouts
3	M	Jan. 14	Lesses	RSO Radiation Safety Training	RSO Web
4	W	Jan. 16	Lesses	RSO Hands-On Training/Test	
HOLIDAY	**M**	**Jan. 21**	**HOLIDAY**	**MARTIN LUTHER KING JR. DAY**	**HOLIDAY**
5	W	Jan. 23	Grissom	Fundamentals of Nuclear Decay/Chart Nucl	Handouts
6	M	Jan. 28	Grissom	Radiation Detection Instrumentation	CANVAS
7	W	Jan. 30	Grissom	Instrumentation/Nuclear Reactors	
8	**M**	**Feb. 4**	**EXAM I**	**EXAM I**	**EXAM I**
9	W	Feb. 6	Grissom	Liquid Scintillation Counting Methodology	
10	M	Feb. 11	Grissom	Liquid Scintillation Counting Con't.	
11	W	Feb. 13	Grissom	Alpha Spectrometry	
HOLIDAY	**M**	**Feb. 18**	**HOLIDAY**	**PRESIDENT'S DAY**	**HOLIDAY**
12	W	Feb. 20	Grissom	Gamma Spectrometry	
13	M	Feb. 25	Grissom	Neutron Capture Crossections/NAA	
14	W	Feb. 27	Grissom	Actinides and the Transuranium Series	
15	M	Mar. 4	Grissom	Radiotracer Methodology	
16	W	Mar. 6	Grissom	Radiotracer Methodology	
HOLIDAY	**M-S**	**Mar. 11-15**	**HOLIDAY**	**SEMESTER BREAK – No Classes**	**HOLIDAY**
17	M	Mar. 18	Grissom	Radiochemical Synthesis	
18	W	Mar. 20	Grissom	Radiochemical Synthesis	
19	M	Mar. 25	Grissom	Radiochemical Purification and Separation	
20	W	Mar. 27	Grissom	Radiochemical Purification and Separation	
21	M	Apr. 1	Grissom	Biological Effects of Radiation	
22	W	Apr. 3	Grissom	Health Physics / Radon Daughters	
23	M	Apr. 8	Grissom	Positrons, Cyclotrons, and Tomography	
24	**W**	**Apr. 10**	**EXAM II**	**EXAM II**	**EXAM II**
25	M	Apr. 15	Grissom	Biological Effects of Radiation	
26	W	Apr. 17	Grissom	Biological Effects of Radiation	
27	M	Apr. 22	Grissom	Radiopharmaceuticals	
28	W	Apr. 24	Grissom	Radiopharmaceuticals	
FINAL	**R**	**May 2 10:30-12:30**	**FINAL**	**FINAL EXAM**	**Comprehensive**