

Forensic Science with Laboratory – CHEM 107
Spring Semester 2008

MWF 10:45 – 11:40 SC 282 Lecture

M 2:00 – 5:00 SC 371 Lab

Instructor: Dr. Douglas Beussman

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Objectives: This course will introduce the fundamentals of forensic science focusing on how samples are collected and analyzed and what information can be obtained. Topics covered will include hair analysis, paint analysis, drug screening, arson investigation, ballistics, and DNA analysis. Lab experiments will utilize state-of-the-art forensic techniques to collect and analyze evidence, such as fingerprinting, drug analysis, arson investigation, blood alcohol determination, DNA fingerprinting, and fiber analysis. The lab meets for one three-hour session per week.

Prerequisites: None

Course web page: The URL for CHEM 107 web page is:

<http://www.stolaf.edu/people/beussmad/Chem107/>

Grading: Grades will be assigned based on a straight scale from the results of eight problem sets, three regular exams, one comprehensive final exam, and lab reports.

Exam 1	100 points
Exam 2	100 points
Exam 3	100 points
Problem Sets (8)	100 points total
Lab Experiments	100 points total
Final Exam	<u>150 points</u>
TOTAL	650 points

Grades

>90%	A	(A+/A/A-)
>80%	B	(B+/B/B-)
>70%	C	(C+/C/C-)
>60%	D	(D+/D/D-)

Problem Sets: Eight problem sets will be given throughout the semester. Homework should be turned in during class, but will be accepted until 5:00 PM in SC 328. *Any homework turned in after 5:00 PM the day it is due will not be graded, unless previous arrangements have been made with the instructor.* Students are allowed to work on the problems as a group, but each student must turn in their own work. Handing in photocopied or hand-copied answers constitutes academic dishonesty.

Exams: All exams will be closed book and closed notes. No make-up exams will be given unless prior arrangements have been made with the instructor (discussion of scheduled absence prior to exam, phone or email message if ill, etc.). Unless otherwise announced, calculators will be allowed, however, the use of programmable calculators to store information of any sort (definitions, equations, etc.) will constitute cheating and will be handled as described below. Calculators are subject to examination at any time. After graded exams are returned, students will have one week to turn exams in to be regraded. The reason for the regrade must be given in writing.

Laboratory: Approved safety goggles, which students must purchase, must be worn at all times in the labs. Gloves will also be provided. Students will work in teams of three. Students will assume the role of Team Leader, Technician, or Information Specialist.

The **Team Leader** is in charge of the group. The **Team Leader** will need to make all decisions and ensure that the other members of the team complete their jobs. The **Team Leader** will be responsible for signing out all evidence. The chain of custody is the responsibility of the **Team Leader**, and any breach in the chain will be attributed to the **Team Leader**. The **Team Leader** will also need to submit a written report (paper copy or email attachment as appropriate) within one week of completion of the lab. This report should describe (1) the evidence in question, (2) the method used in the lab to analyze the evidence, including an explanation of the scientific concepts behind the techniques used, (3) the results from the analysis (including any data collected or the results of any data analysis), and (4) the conclusions drawn based on the scientific analysis of the evidence. One copy of the notes recorded by the **Information Specialist** during the forensic investigation of the evidence should be included in this report. The grade for the lab will be based on this report, so the **Team Leader** should include as much detail as possible.

The **Technician** is responsible for performing all analyses required for each forensic investigation. This might entail learning how to operate an instrument to analyze the evidence, performing chemical reactions, or performing other tests on the collected evidence. The **Technician** will also be responsible for safely handling and disposing any chemicals used.

The **Information Specialist** is in charge of keeping a record of all steps performed in the forensic analyses, and the results obtained. The **Information Specialist's** notebook will serve as the primary record of the investigation of the evidence and is thus subject to inspection at any time. The records kept by the **Information Specialist** would be used in court and thus must be as accurate and complete as possible. The notebook will also help the **Team Leader** write the summary lab report. One copy of the notes taken should be included in the report submitted by the **Team Leader**. The **Information Specialist** is also in charge of making any charts or graphs needed by the **Team Leader** and performing any data analysis required.

The three roles will rotate each week, so that each team member has the opportunity to experience each role several times over the course of the semester. A listing of the labs and the role rotation will be provided. Completion of all labs is required, and absences must be discussed with the instructor prior to the scheduled lab whenever possible. Missed labs will require completion of comparable exercises outside of scheduled lab meetings.

Textbooks: *Criminalistics: An Introduction to Forensic Science, Ninth Edition*
Richard Saferstein

Lecture Number	Date	Topic	Reading	HW Due
1	2/8	Introduction	4-26	
2	2/11	Crime Scene	38-57	
3	2/13	Physical Evidence	70-86	
4	2/15	Glass and Soil Analysis	100-124	1
5	2/18	Molecular Structure, Energy Levels	Handouts	
6	2/20	Organic Compounds	Handouts	
7	2/22	Polarity, Acid-Base Chemistry	Handouts	2
8	2/25	Organic Analysis – Separations	128-144	
9	2/27	Organic Analysis – UV/Vis, IR Spectroscopy	144-150, 169-171	
10	2/29	Organic Analysis – Mass Spectrometry	150-155	3
11	3/3	Inorganic Analysis, Atomic Absorption	160-169	
12	3/5	Hair Analysis	208-219	
	3/7	EXAM		
13	3/10	Fiber Analysis	219-232, 87-97	
14	3/12	Paint Analysis	232-243	
15	3/14	Drug Classes	248-268	4
16	3/17	Drug Analysis	268-275	
17	3/19	Toxicology – Alcohol	280-297	
	3/21	BREAK		
	3/24	BREAK		
	3/26	BREAK		
	3/28	BREAK		
18	3/31	Toxicology	297-307, 29-35	
19	4/2	Serology – Blood Analysis	346-358	5
20	4/4	Serology – Blood Patterns, Heredity	359-377	
21	4/7	DNA basics	382-390	
22	4/9	DNA Typing	390-410	
	4/11	EXAM		
23	4/14	DNA – Collection, CODIS	410-418	
24	4/16	Time Since Death – Body Stages	Handouts	6

25	4/18	Time Since Death – Entomology	Handouts	
26	4/21	Arson	312-326	
27	4/23	Explosives	327-340	
28	4/25	Fingerprints – Basics	428-440	
29	4/28	Fingerprints – Detection	440-455	
30	4/30	Ballistics	460-471	7
31	5/2	Gun Powder Analysis	471-481	
32	5/5	Tool Marks/Impressions	481-493, 198-205	
33	5/7	Document Analysis	498-514	
	5/9	EXAM		
34	5/12	Voice Analysis	515-520	8
35	5/14	Review		
	5/16	FINAL EXAM		

Instructor reserves the right to make changes throughout the semester as needed.