TO: The Faculty of the College of Engineering

FROM: The Faculty of the Division of Environmental and Ecological Engineering

RE: Cross-listing of AGRY 38500 with EEE 38500, Environmental Soil Chemistry

The Academics Committee of the Division of Environmental and Ecological Engineering has approved the establishment of new course numbers, EEE 38500, and the permanent cross-listing of the course with the existing course AGRY/NRES 38500. Course attributes, descriptions, and pre-requisites are not changing, nor is the content or the syllabus of either course changing. This action is now submitted to the Engineering Faculty with a recommendation for approval.

EEE 38500 Environmental Soil Chemistry
Terms offered 1 Lecture/Lab, Cr. 4.
Cross-listed with AGRY 38500, Environmental Soil Chemistry

Description: Designed as an upper level introductory course covering environmental soil chemistry concepts in framework most applicable to inorganic and organic chemical contamination of soil and water resources and intended for students in environmental science fields that may not have a strong chemistry and/or math background. (el.5).

Reason: We are seeking the cross-listing of this course because the faculty member who typically teach this course is transitioning from a 100% appointment in Agronomy to a 75/25 joint appointment between AGRY and EEE. The course is typically offered in the fall semester and, in light of the faculty transfer, AGRY/NRES and EEE have agreed to share responsibility and provide equal resources (including TAs) toward the offering of the course. It is therefore appropriate for the course to be cross-listed. In addition this will provide appropriate recognition of the teaching contributions for the faculty member.

Submitted by:

John W. Sutherland
Fehsenfeld Family Head
Environmental and Ecological Engineering

Enrollment for AGRY/NRES 38500 for the last three years:

Semester	AGRY	NRES	Number of EEE students
Fall 2017	11	2	2
Fall 2018	25	0	4
Fall 2019	18	0	0

Syllabus from Fall 2018 follows

AGRY/NRES 385 *ENVIRONMENTAL SOIL CHEMISTRY* *Fall 2018*

COURSE DESCRIPTION: Credit Hours: 4.00. (NRES 38500) Designed as an upper level introductory course covering environmental soil chemistry concepts in framework most applicable to inorganic and organic chemical contamination of soil and water resources and intended for students in environmental science fields that may not have a strong chemistry and/or math background. (el.5). Typically offered Fall.

Lectures: Monday, Wednesday & Friday 1:30-2:20 pm in 3-410 Lilly Hall ***(Unless otherwise noted*)***
Laboratory: Tuesday 8:30 - 11:20 pm in 3-427 Lilly Hall*
Occassionally, we will need to me in the lab on a lecture day. Also, if we are not doing a wet lab on lab day, we will meet in 2-458 Lilly Hall.

Instructor: Linda S. Lee 494-8612 (Voice Mail)
Office: B480 Lilly Hall EMAIL: lslee@purdue.edu

Office Hours for either Instructor or TA: Office hours are best by appointment. Appointments can be made via email, but allow sufficient time for me or the TA to confirm. **Email is a great mechanism for questions/answers as well.**

TEXT: No textbook requirement; however, wherever appropriate, I will refer you to Soil Chemistry (Strawn, et al., 2015; published by Wiley) that Purdue libraries has now the ebook for free student access to read online or download in addition to posting copies of other materials that may be helpful on BB.

Course Goal: Become knowledgeable and gain some semi-quantitative and quantitative skills in the fundamental properties and processes responsible for the environmental fate of contaminants in the soil-water environment with emphasis on soil and solution chemistry.

Intended Audience includes students in an environmental science field that may not have strong chemistry/math backgrounds. This is an upper level introductory course covering environmental soil chemistry concepts in the framework most applicable to metal, nutrient, and organic chemical contamination of soil and water resources.

LEARNING OBJECTIVES

- Develop an understanding of the fundamental chemical processes that control mobility and bioavailability of organic and inorganic chemicals in soil and water systems.
- Perform soil and chemical measurements in the laboratory, judge the quality of the data collected and correlate data to key physical and chemical properties.
- Perform mass balance calculations, unit conversions, balancing chemical equations, and linear regressions as well as construct graphs displaying and comparing data trends.
- Compare and contrast partitioning of chemicals in different soils as a function of key soil properties.
- Develop experience in chemical equilibria to understand problems in geochemical processes such as solubility, speciation, fate and transport.
- Develop and understanding of oxidation-reduction processes and how these processes affect chemical behavior in the environment.
- Utilize case study assignments to understand and apply chemical principles and processes important in current environmental problems.

Course Evaluation:	Laboratory* Reports & Homework Assignments	35 %
	In–Class Exams (3 @ 15% each)	45 %
	Class Attendance/Participation/Preparedness**	10 %
	Project *(Pages 8-9)*	10%

* -25 points if you are absent during a lab without prior approval except for proof of a documented family emergency or illness

** Include pre-lab assignments due at the start of a wet lab and brief summary/questions associated with group projects.

Grading Scale: A+ ≥ 98%, A 93-97.9%, A- 90-92.9%, B+ 87-89.9%, B 83-86.9% B- 80-82.9%, C+ 77-79.9%, C 73-76.9%, C- 70-72.9%, D+ 67-69.9%, D 63-66.9%,D- 60-62.9%, F below 59.9%

On Blackboard Learn

- Lecture material will typically be posted no later than 12 hours before lecture.[§]
- Lab assignments will be posted by the Saturday before the scheduled lab.[§]
- Copies of journal articles and book chapters referenced in class as available.
- Keys to homework and exams will be posted as available.

[§] You are responsible for printing course materials.

Grading Policy: Extra effort is put forth in making assignments and exams fair; therefore, curving based on class averages is rarely done. If your course average falls within one point short of a higher letter grade, my decision to report the higher letter grade will be based on your class participation and class preparedness.

Class Participation & Preparation: Being prepared for class will increase your participation, which is contagious, and thus will make our class time together more fruitful and stimulating. I hope that what you learn in class should be sufficient to make you want to be there. Nevertheless, class attendance is expected AND class attendance during student presentations is MANDATORY (10 % of your project grade) and the key concepts and highlights from student presentations are included as material that will eb covered on the exam for the associated section.

Late Policy: In terms of timeliness, submission of assignments by specified due dates is expected. I understand that occasionally demands may be such that you may want an extra day, which I am not adverse to approving. However, if being allowed a grace day is abused, it will no longer be offered. Late assignments may result in a delay in the availability of the associated answer key, which affects the entire class. Therefore, an assignment that is more than one day late is subject to a 10% grade reduction. ***Preferebaly assignments should be turned in at the beginning of class, but alternatively, they can be placed in the box outside my office door. As last resort, they can be emailed but don't make this a habit otherwise, the option may be removed.***

Make-Up Exams: Make-up exams will only be given due to extraordinary circumstances and with pre-approval, or due to a sudden illness or death in the family.

Academic Honesty and Integrity: Purdue students should maintain the Purdue Honors Pledge **"As a boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together - we are Purdue."** On most assignments you may work together unless specified otherwise;

however, it is not acceptable for students to hand in identical assignments. **Copying** another student's work or a published author's work is **NEVER acceptable**. Submitting someone else's work as your own, as well as work you have previously used in another class is also **not acceptable**. For a guide to academic integrity posted by the Dean of Students see http://www.purdue.edu/ODOS/adminstration/integrity.htm.

Academic integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breeches of this value by either emailing integrity@purdue.edu or by calling 765-494-8778. While information may be submitted anonymously, the more information that is submitted provides the greatest opportunity for the university to investigate the concern.

Lab Reports, Weekly Assignments, and pre-Lab Assignments

Pre-Lab Assignments: At the beginning of each wet lab (usually a Tuesday but in a few cases we start labs on Monday), you will hand in your pre-lab assignment, which is part of your class preparedness and participation grade (5% of your overall grade). Pre-lab assignments are designed to make sure you have read the lab in advance sufficient to have a general idea of what you will be doing in lab that day. This should help to optimize your time in the lab and minimize common mistakes made.

Lab Reports: Each person must turn in their own lab assignment even though you will collect lab data together. There may be exceptions to this on occasions, which will be announced in advance. **Lab assignments must be submitted before midnight on the day they are due UNLESS SPECIFIED OTHERWISE.** Late assignments will be penalized 10% per day until a Key is posted after which no credit will be given.

Other Assignments: In addition to lab reports there will be worksheets and case study assignments periodically throughout the semester. All assignments will have clear due dates, which must be honored. Late assignments will be penalized 10% per day up until a Key is posted after which no credit will be given.

Project (10% of your grade): Your class project with 1-2 other class members will consist of a PowerPoint presentation presented in the Oct. 29 - Nov. 2 timeframe ir Dec. 3 - 8 timeframe with outline and pre-presentation due dates prior to your presentation. You are expected to (1) present a pre-approved case study focused on a particular contaminant; (2) highlight the relevant contaminant properties and processes that affect the fate of that contaminant in the soil-water environment; (3) apply that knowledge base to understanding what was observed in the case; and (4) propose the most likely remediation or management options for the particular contamination scenario highlighted in your case. You will request a case from a list provided by the end of August. If you prefer a case not listed, you may submit a request with the case and justification for why you want to focus your project on that case. Additional project details are on page 9.

Final Exam: The third exam will be given during the University-scheduled Final Exam time and will be comprehensive BUT concentrated on material not covered in Exams 1 and 2.

Other Important things for optimizing your college success:

Being part of a community of respect: Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life. Purdue's nondiscrimination policy can be found at: http://www.purdue.edu/purdue/ea_eou_statement.html.

CAPS Information: Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, services are available. For help, such individuals should contact Counseling and Psychological Services (CAPS) at (765)494-6995 and http://www.purdue.edu/caps/ during and after hours, on weekends and holidays, or through its counselors physically located in the Purdue University Student Health Center (PUSH) during business hours.

Disability Resource Center (DRC): DRC is a resource for students and instructors. Students may present a "Letter of Accommodation" to you at any point in the semester. Should you have questions about accommodations, please contact the DRC at: 494-1247. You may also visit the DRC at drc@purdue.edu.

Emergency Preparedness Information

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to change and may necessitate a revised semester calendar or other circumstances beyond the instructor's control. Here are ways to get information about changes in this course in order of priority.

- Blackboard learn
- Email me lslee@purdue.edu
- Call me (765) 494-8612 (office), (765) 414-3086 (cell)

REMEMBER, WHEN YOU HEAR:

- ALL HAZARDS SIRENS: immediately seek shelter (Shelter-In-Place) in a safe location within closest facility.
- FIRE ALARMS: immediately evacuate the building and move to a safe location.

In both cases, you should solicit additional clarifying information by all possible means: Purdue Homepage, TV, radio, email, etc.

Links to information about ongoing emergencies:

- On campus emergency - http://www.purdue.edu
  Allow at least 15 minutes for information to be posted.
- Local news - http://www.wlfi.com and http://www.jconline.com
- Cell phones - http://www.purdue.edu/securepurdue/
  Cell phone emergency text messages will be sent to those signed up for them.

- To report an emergency, call 911. To obtain updates regarding an ongoing emergency, sign up for Purdue Alert text messages, view www.purdue.edu/ea.
- There are nearly 300 Emergency Telephones outdoors across campus and in parking garages that connect directly to the PUPD. If you feel threatened or need help, push the button and you will be connected immediately.
- If we hear a fire alarm during class we will immediately suspend class, evacuate the building, and proceed outdoors. Do not use the elevator.
- If we are notified during class of a Shelter in Place requirement for a tornado warning, we will suspend class and shelter in the basement of Lilly Hall.

- If we are notified during class of a Shelter in Place requirement for a hazardous materials release, or a civil disturbance, including a shooting or other use of weapons, we will suspend class and shelter in the classroom, shutting the door and turning off the lights.

EMERGENCY PREPAREDNESS WEBSITE:
http://www.purdue.edu/ehps/emergency_preparedness/index.html

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to change that may be necessitated by a revised semester calendar or other circumstances. Here are ways to get information about changes in *this* course: the Blackboard online course, our department emails, and our office phones (see top of syllabus).

AGRY/NRES **385** **ENVIRONMENTAL SOIL CHEMISTRY** *Tentative Order* of Fall 2018 Lecture/Lab Topics

Week	Month/Day	Lecture Topics	Lab Topic
1	August 20	Safety, Introductions, Course Objectives, pre-quiz,Pictures	
	August 21	**Dry Lab (2-458 Lilly w/ brief visit to 3-427 Lilly) ⇒**	**B367**: Review Balancing Chemical Eq., Unit Conversions, Periodic Chart, Worksheet *due 8/28; **3-427**, Basic Lab Orientation/Safety
	August 22 August 24	Overview of Environmental Soil Chemistry and Processes Affecting Chemical Behavior in Soil-Water Systems* pH, pK_a and Acid-base Chemistry	
2	Aug. 27	pH, pK_a and Acid-base Chemistry (cont'd) Calculations/Graphing with Excel	**BRING YOUR LAB TOPS** if you have one
	Aug. 28	**Lab ⇒ 3-427 Lilly Hall**	Acid-Base Chemistry: pH and Acid-Base Titrations (Wet Lab) *Lab due 9/4
	Aug. 29 Aug. 31	Soil pH, Soil Acidity and Buffer Capacity Soil Domain I: Soil Minerals (1 of 2)	
3	Sept. 3	Labor Day Reactive	
	Sept. 4	**Lab ⇒3-427 Lilly Hall and Lecture 2-458 Lilly**	Lab: Soil pH, Acidity, and Ability to Buffer *Lab due 9/11 Lecture: Soil Domain I: Soil Minerals (2 od 2)
	Sept. 5 Sept. 7	Buffer Capacity (cont'd) Soil Domain II: Soil Organic Matter	Worksheet: pK_a and Clay, Due 9/12 Fri
4	Sept. 10	Organic Matter (cont'd)	
	Sept. 11	**Lab ⇒3-427 Lilly Hall**	Organic Matter Lab (*Data sheet due 9/14) OM Lab discussion questions due 9/18
	Sept. 12 Sept. 14	Intro. to Cation & Anion Exchange Processes/Measurement Exchange Capacity, Sample Calcs., & Selectivity	
5	Sept. 17	**Go to LAB (3-427 Lilly Hall)**. Initiate Cation Exchange Capacity (CEC); *return to 3-410 for lecture/problems*	Pre-lab due TODAY
	Sept. 18	**Lab ⇒ 3-427 Lilly Hall**	Finish CEC Lab: Base and Acid Cations *Worksheet due Fri. 9/21; Full Lab due 9/25
	Sept. 19 Sept. 21	Dispersion/Flocculation Inorganic Constituents: Overview, Environmental Classification, & Chemical Fate Processes	

Week	Month/Day	Lecture Topics	Lab Topic
6	Sept. 24	Sorption Trends for *Cationic* Inorganics	
	Sept. 25	**Lab ⇒ 2-458 Lilly Hall**	**Exam 1 Cranium Review**
	Sept. 26	Sorption Trends for *Cationic* Inorganics (cont'd)	
	Sept. 28	Sorption Trends for *Anionic* Inorganics	
7	Oct. 1	**EXAM #1 (All material through September 19th)**	
	Oct. 2	**Lab ⇒ 2-458 Lilly Hall**	Zinc in the Agricultural Ecosystem- Case Study (Dr. Camberato) Mini HW due 10/5
	Oct. 3	Sorption and Sorption Models	
	Oct. 5	Sorption and Sorption Models (cont'd)	
8	Oct. 8	OCTOBER BREAK	
	Oct. 9	OCTOBER BREAK	OCTOBER BREAK
	Oct. 10	Precipitation & Dissolution	
	Oct. 11	Redox and Eh-pH Diagrams	
9 ***Soil-Human Health Conf. (15-17)***	Oct. 15	Initiate metal/metaloid sorption Lab (**3-427 Lilly Hall**)	Pre-lab due TODAY
	Oct. 16	**Lab ⇒ 3-427 Lilly Hall**	Finish metal/metalloid sorption lab Full lab report due 10/23
	Oct. 17	Redox and Eh-pH Diagrams (Continued)	Worksheet Precip/Dissol./redox due 10/26
	Oct. 19	N, P, S highlights w/ P focus	
10	Oct. 22	**3-427** Initiate P Lab (Part I) and return to 3-410 Lecture then lecture on – N, P, S highlights w/ P focus	Pre-lab due TODAY
	Oct. 23	**Lab ⇒ 3-427 Lillly Hall**	P Lab continued (Part II)
	Oct. 24	Finish P Lab (3-427 Lilly Hall)	P lab worksheet/report due 10/30
	Oct. 26	Remediation Examples for Inorganics	
11	Oct. 29	***Student presentations:***	
	Oct. 30	**Lab ⇒ 2-458 Lilly Hall**	Field Trip or Erin Brocovich Movie on Chromium Behavior **(2-458 Lilly Hall)** ***with Q&A***
	Oct. 31	***Student presentations:***	
	Nov. 2	***Student presentations:***	

Week	Month/Day	Lecture Topics	Lab Topic
12 *SETAC & SSA/ASA*	Nov. 5	Introduction to Organic Chemicals in the Environment	
	Nov. 6	**Lab ⇒ 2-458 Lilly Hall**	Exam #2 Cranium Game Review
	Nov. 7	**EXAM #2 (All material through Nov 2)**	
	Nov. 9	Sorption of Nonpolar or Weakly Polar Chemicals	
13	Nov. 12	Initiate Organic Chemical Sorption Lab (**3-427 Lilly Hall**)	
	Nov. 13	**Lab ⇒3-427 Lilly Hall and 2-458 Lilly Hall**	Finish Organic Chemical Sorption Lab (HPLC Analysis) *Lab due 11/28 Nomenclature Review
	Nov. 14	Sorption on Nonpolar (continued)	Organic Worksheet *due 11/26
	Nov. 16	Vapor Pressure, Gas Chromatography, & Weathering	
14	Nov. 19	Sorption of HOCs: DOC and Surfactants	
	Nov. 20	**Lab ⇒** *No class*	
	Nov. 21	*THANKSGIVING HOLIDAY*	
	Nov. 23	*THANKSGIVING HOLIDAY*	
15 ***SERDP (27-29)***	Nov. 26	Sorption of Ionizable Organic Chemicals (Acids)	
	Nov. 27	**Lab ⇒ 2-458 Lilly Hall**	Sorption of Ionizable Organic Chemicals TCP Case Study, Worksheet *due 12/4
	Nov. 28	Sorption of Ionizable Organic Chemicals (Bases, Zwitterioncs)	
	Nov. 30	Remediation of Organics or Special Topic	
16	Dec. 3	***Student presentations:***	
	Dec. 4	**Lab ⇒ 2-458 Lilly Hall**	Exam #3 Cranium Review
	Dec. 5	***Student presentations:***	
	Dec. 8	***Student presentations:***	

Exam 3 will serve as the FINAL for this class and will focus on organic chemical behavior in the environment (material presented on or after Nov 5th.

AGRY/NRES 385 Project & Participation
AGRY/NRES 385 Project

Your class project will consist of a PowerPoint presentation, reference list, and extended abstract/summary (1-2 pages single space). Your PowerPoint presentation should focus on presenting the properties and processes that affect the fate of the primary compound or compound class in the soil-water environment and exemplify 1-3 specific environmental cases involving your compound or compound class. Also, where appropriate, note remediation or management options that are available to mitigate the problems identified. In addition to the material provided for your case, you should use sources including the scientific literature, popular press, and news releases, etc. in preparing your presentation. Your oral presentation should focus on the use of pictures, simple tables, and simple graphs to highlight important characteristics of your contaminant or contaminant class, relevant contaminant fate processes, and environmental case(s). You may use figures, pictures, and tables from the literature as long as you cite it. **However, often times it is more effective to recreate simplified graphs and tables from those in the literature rather than use them directly, which is not only a better visual but usually exemplifies some level of synthesis.** Your extended abstract should contain the main concepts and cases presented in your oral presentation.

Project choices and teams: You will get a chance to make your 1st, 2nd, and 3rd contaminant preferences (***see page 3 and 4***) as well as list any preferred person(s) for your team. Based on the information provided, I will make team and contaminant assignments. I will do my best to give you your team and contaminant preferences.

Project deliverables after case assignment:

- **A project outline of what concepts, potential cases (site-specific contamination issues), and potential remediation/management options you plan to highlight AND a DRAFT of your extended abstract* are due 2 weeks before your scheduled presentation so I can provide input and make sure you are on task.**
- **Rough draft of your PowerPoint is due to me 4 days prior to your oral presentation**
- **Team PowerPoint presentation on your assigned date:**
  - 15 to 20 minute oral presentation plus 5 minutes discussion
  - See evaluation guide on next page to help you think about how and what you are presenting. Design presentation accordingly.
  - Provide at least 3 questions (e.g., short answer, multiple choice, fill-in the blank) at the end of your presentation (or within your presentation) that you will have the class answer based on what you have presented. **These questions may be used again on the exam and definitely in the Cranium game before the exam.**

- ***Final Extended abstract** including citations and references. Final version due within one week after your oral presentation or prior to the last day of finals, whichever comes first. 1-2 pages single space (**not including** reference list) with a citations from at least 8 scientific literature sources; web sites may be cited, but not exclusively.

Evaluation Guide

Oral and written presentations will be graded based on

- Clarity, organization, and oral or written skills
- Application of course concepts to your case
- Quality of visual aids (especially in your oral presentation.

All oral and written project reports must include:

- Summary of why a particular contaminant or contaminant class is an environmental concern
- Basic processes controlling the fate of this contaminant or contaminant class with an emphasis on processes occurring in soils as discussed in class, *which should be more detailed or improved in your written report after input from your project presentation and follow up lectures*
- Case study example(s)
- Application of the processes to your case study examples
- Remediation or management options to mitigate the problems exemplify in your case study example(s)

A good tutorial support for oral presentations can be found at:
https://student.unsw.edu.au/support-oral-presentations

AGRY/NRES 385
Laboratory Assignments: Outline, Expectations, & Safety

PREPARATION:

Come to lab prepared! This includes pants and shoes that cover your feet on the days we are doing a wet lab. Before starting the lab, you need to have a lab coat and goggles – bring your own or use what is in the lab**.**

ALSO you should have carefully read through the lab handout before lab begins, be ready to ask any questions you may have at the beginning of lab, and be on time.

To aid in making sure you are prepared, you are responsible for submitting completed pre-lab worksheets (5 points of your lab report for that lab) at the beginning of each wet lab. Pre-lab worksheets are designed to make sure you have read the lab in advance sufficient to have a general idea of what you will be doing in lab that day.

OUTLINE:

Each lab assignment is worth 100 points. Each person must turn in their own lab assignment even though you will collect lab data together. **Lab assignments must be turned in by 5:00PM on the day they are due UNLESS SPECIFIED OTHERWISE (e.g., prior to an exam week).**

I try hard to limit your assignments to one per week, thus if you have a lab assignment due, I try not to give you an additional homework sheet. When we have dry labs, case studies, or lectures during the lab period, a homework assignment in lieu of a lab assignment will usually be given. Homework assignments usually take less time than lab assignments and may, therefore, be worth less total points. Lab assignments are expected to be prepared using **Microsoft Word and Excel**.

Required Components of a Laboratory Assignment:

I. Your **Name**, **Date**, and **Title** of the lab exercise.

II. **Objective** - state lab objective

III. **Data Analysis and Results** – Summarize your data and results in well-organized tables and/or figures generated in Word or Excel. Number your responses to the questions asked at the end of the lab accordingly. If you choose to place figures or tables at the end of your assignment, please number them and refer to them accordingly in response to the questions asked. **Example calculations must be shown for all quantitative steps**, e.g., show a calculation for one sample, but do not repetitively show it for all identical calculations. Example calculations may be written out by hand if done neatly.

IV. **Discussion Questions** - You will typically be given a list of questions at the end of your lab handout (or handed out separately at times) that usually relate directly to your observations. **Provide written answers in a well-structured, cohesive, and succinct manner.** This is your opportunity to see what you really understand about what I hoped you would learn in the lab, and will give you critical practice at synthesis of information, which is an important skill for most of the jobs you will likely be interested in acquiring.

V. **Comment Section** - At the end of your lab reports, please make comments regarding the laboratory exercise including problems you had doing or understanding the lab exercise, if additional information would have been helpful, any problems within your group, etc.

General Comments on Safety, Wastes, and Clean up

Safety:

- Wear laboratory glasses/goggles at all times if anyone in the laboratory is involved in a wet lab activity.
- Wear lab coats to protect your clothing as needed.
- Wear gloves to protect your hands as needed.
- Note location of safety shower and eye wash station.
- Wear closed shoes to wet labs, which includes lecture days used for starting a wet lab.

Rules for Laboratory Safety

1. No food or beverages in the laboratory.
2. Wear a lab coat at all times in the laboratory.
3. Wear safety glasses when working in the laboratory.
4. Wear appropriate gloves when and where a reasonable chance exists of your hands contacting chemicals that have harmful or unknown properties.
5. Do not wear gloves outside the laboratory.
6. Do not re-use disposable (latex) gloves—put on a fresh pair.

Wastes: Be aware of what chemicals may be disposed of down the drain, and dispose of accordingly. In general the following may be disposed of in the sink followed by running water:

1. Organic and organic acids with a pH between 5 and 10; neutralization is permitted to bring the pH into the proper range.
2. Aqueous buffer solutions that contain no regulated materials: these include common salt solutions (chlorides, bicarbonates, carbonates, citrates, phosphates, sulfates, and acetates) of sodium, potassium, magnesium, and calcium.
3. Aqueous solutions with less than 24% ethanol, n-propanol, and isopropanol (24% is based on flammability).
4. No more than unavoidable traces of highly toxic organic chemicals, such as found on the surfaces of glassware.

If in doubt, ask your Teaching Assistant!

Cleaning Up/Dish Washing: You are responsible for making sure the laboratory is left as clean as when you arrived, including the washing of lab ware unless specified otherwise within each lab.

In general for this lab,

1. Remove labels using soapy water or acetone
2. Wash in warm laboratory cleaner (usually a dilute solution of Liqui-Nox or Alconox)
3. Thoroughly rinse with hot tap water
4. Thoroughly rinse with either an organic solvent (acetone, methanol) when used with organic chemicals or with weak nitric acid when used for inorganic chemicals
5. Rinse well in deionized (DI) water
6. Store volumetrics as found (e.g., if they contained DI water and were capped when you found them, then return as found before placing back in storage area)