Introduction to CHEM-4181

CU- Boulder

CHEM-4181

Instrumental Analysis Laboratory

Prof. Jose-Luis Jimenez

Spring 2007

Presentation is posted on course web page – mostly same info as lab manual

The People Involved

- Instructor: Jose-Luis Jimenez
  - Build and use instrumentation (MS) for a living
  - First time teaching this class
  - Office hours: Mon & Fri 12-1
- TAs:
  - Jesse Marcum (full-time)
  - Paul Nelson (half-time)
  - Patrick Veres (half-time)
- 23 students
  - Brief introductions
  - 3 sections
    - 7/9/9 students
    - Tue, Wed, Thu 12-6 pm

Objectives of the Course

- Review of:
  - Statistical data analysis
  - Scientific writing
  - (These were weak areas based on prior offerings, and you need to do them well for lab reports)
- Fundamental understanding of modern chemical analysis
- Hands-on experience with common instrumental techniques
  - Most basic, a few research-grade instruments. But mostly same procedures as more expensive ones
- Develop critical thinking and evaluation skills within a scientific framework

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Materials for the Course

- Lab Manual in UMC bookstore
  - Read, lots of useful info beside experiment details
- Principles of Instrumental Analysis, Skoog, Holler, and Niemann, 5th edition
  - 6th edition just came out, also ok
- Laboratory notebook
  - Your choice but must be research-grade
- Email list: chem-4181@lists.colorado.edu
- Web page: http://cires.colorado.edu/jimenez/CHEM-4181/

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Lecture Schedule

Lecture Date	Topic	
Lecture Date	**Topic**	
January 17 (W)	Introduction	
January 19 (F)	Data Evaluation and Statistics	Needed for
January 22 (M)	Data Evaluation and Statistics	good lab
January 24 (W)	Data Evaluation and Statistics	reports
January 26 F)	Scientific Writing	
January 29 (M)	Scientific Writing	
January 31 (W)	Scientific Writing	
February 2 (F)	No Class	
February 5 (M)	Highlights for Lab Experiments	
February 7-23	No Class	
February 26 (M)	Introduction to Student Choice Experiment (Sci. Lit.)	
February 28-March 2	No Class	
March 5 (M)	Highlights for Lab Experiments	
March 12 (M)	Student Choice Experiment Discussion	
March 14-16	No Class	
March 16 (F)	**Student Choice Exp. Approval (in person or e-mail)**	
March 21 (W)	**Student Choice Proposal Due**	
March 23 (F)	No Class	
March 26 – 30	Spring Break, No Class	
April 2 – April 13	No Class	
April 16 (M)	Crafting a Scientific Presentation	
April 18 & 20	No Class	
April 23 (M)	**Student Choice Presentations**	
April 25 (W)	**Student Choice Presentations**	Mandatory
April 27 (F)	**Student Choice Presentations**	attendance
April 30 (M)	**Student Choice Presentations**	
May 2 (W)	**Student Choice Presentations**	
May 4 (F)	**Student Choice Presentations**	

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Lab Schedule

Week Beginning	Experiment/Topic	
Week Beginning	**Experiment/Topic**	
January 15	No Lab	
January 22	Introduction, Check In	
	Group Assignments	
	Rotation Sign-Up (groups & individuals)	
	Glassware Cleaning	
	Introduction to and Preparation for COD Exp.	
January 29	(E1) Chemical Oxygen Demand	
Feb. 5 – Feb. 26	(E2) Atomic Absorbance (Pb in soil)	Groups of 2
	(E3) Molecular Absorbance (Phosphorous in water)	
	(E4) Fluorescence (Oil in water)	Groups of 2-3
	(E5) FTIR (CO in car exhaust)	
Mar. 5 – Mar 19	(E6) GC (PAH's in diesel exhaust)	
	(E7) HPLC (PAH's in cigarette smoke)	
	(E8) Electrochemistry (metal ions in water)	
March 26	Spring Break – No Lab	
April 2	Student Choice Experiment	Groups of 2
April 9	Student Choice Experiment	
April 16	Finish Student Choice and Check Out	
April 23	No Lab – Student Choice Presentations in Class	
April 30	No Lab – Student Choice Presentations in Class	

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Lab sections

- Tue (7)
  - David Bishop, Chandra Avishek, Sarah McKenna, Estefania Mondragon, Benjaming Reed, Joseph Ryerson
- Wed (9)
  - Dane Clausen, Robert Ely, Kyle Galway, Maja Janas, Guillermo Rojas, Sally Sogue, Jung Song, Nicole Suiter, Asa Ware
- Thu (9)
  - Robert Busch, Rocky Draughon, Anne Getts, William Hartwig, James Kim, Michael Monsalve, Elizabeth Saenim, Elissa Uhl, Jennifer Fox
- Need a volunteer to move from Wed or Thu to Tue

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Lab Experiments

- Read experiment description before showing up for lab
- Will work in groups
  - Arrive on time, otherwise team has to wait
  - Penalty if later than 12:15
- Reports are individual
  - Steep penalties for being late on reports (see LM)

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A Good Lab Experiment

- Clearly Identify the question
- Qualitative vs. quantitative
- Determine most appropriate technique(s)
- Do you need to separate analyte from matrix?
- Acquire a representative sample

- See p. 7-8

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Labeling and Waste Disposal

- Every solution that you prepare and which is not consumed that day should have a label
  - Photocopy from notebook, print from web
  - Paste with clear packing tape

Chemical Name:		CAS#:
Concentration and Formula:		
Precautions		
Course:	Prep by:	Prep date:

- In order to receive a grade, you HAVE TO dispose of all waste according to EPA regulations

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Grading

- Homework: 2 x 30 pts
- Lab reports: 8 x 60 pts
  - Submit to TA within 15 min of starting next lab
  - Steep penalties for being late (see LM)
- Weekly lab evaluations by TA
  - Performance = 8 x 10 pts (0 if late to arrive)
  - Notebook = 8 x 5 pts
- Student choice total = 210!
- Clickers: 30
- Bonus points for helping improve course

Your Lab Notebook

- Essential to keep a record of experiments for a scientist
  - Detailed enough for someone else to reproduce experiment
  - Especially important when intellectual property is an issue, or when authenticity is questioned
    - Dated, no blank pages
- To help you develop good notebook skills, TAs will check at the end of every lab
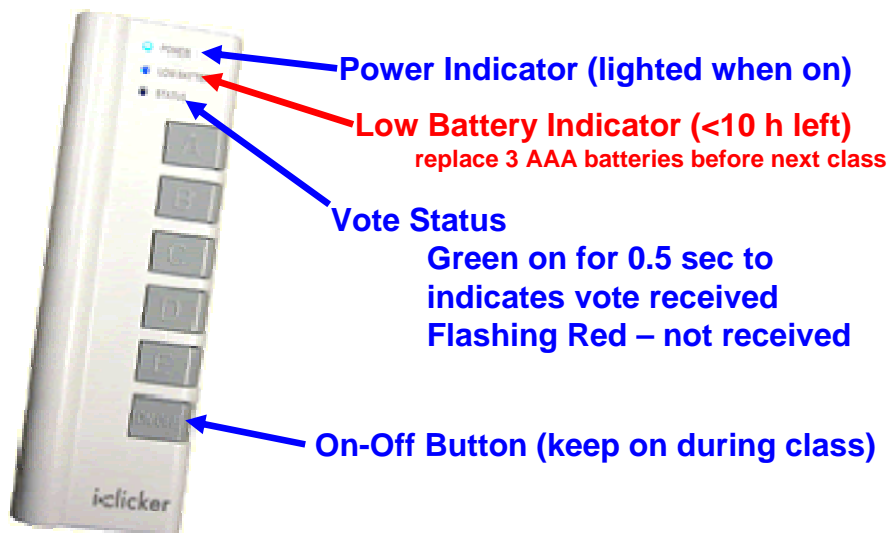- See p.8 and p.59 for details and example

Clickers

- Will use for the data analysis & writing lectures
- No need to buy them
- Have 20 from Chemistry Dept.
  - Need to return them, otherwise charge $30 to your student account
- Does someone have an iClicker? (need 3)
- Grading for participation only
  - Will remove your worst clicker day
  - If you forget it more than once, you loose points

Your iClicker

Power Indicator (lighted when on)

Low Battery Indicator (<10 h left)
replace 3 AAA batteries before next class

Vote Status
Green on for 0.5 sec to indicates vote received
Flashing Red – not received

On-Off Button (keep on during class)

Have you used clickers in a prior class?

- A: Yes, iClickers
- B: Yes, but not iClickers
- C: No
- D: I can't remember

**You are NOT locked in to your first choice.
Final answer entered will be
the one accepted**

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Improving the Course

- Bonus for helping to improve the course
  - Finding mistakes in lab notebook (typos, errors)
  - Proposing improvements & tweaks to main experiments
  - Finding a useful web resource
  - Other useful suggestions (including alternative experiments)
  - If new & adopted, bonus of 1-5 pts per item (depending on how useful)
  - Email / talk to me about suggestions

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Student Choice Experiments I

- Normally groups of 2 people (or individual)
- Should be a real problem
  - Environmental, food analysis
  - Has to be done with instruments in class, can't use instruments available to you elsewhere
- Effort in creativity (e.g. caffeine in chocolate done every year)
- Procedures with extensive chemical workup are not appropriate (e.g. 1 page of workup in journal article => too much time)
- Must be planned and approved by March 16
  - Will discuss in class on March 12
  - But you can start thinking now (see example p. 66 of LM)

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Student Choice Experiments II

- Timeline
  - 3 weeks to perform experiment
  - Lab open 9-5, but TAs there only during regular lab hours
  - Instrument schedule if several groups need to use same instrument
  - No lab after week of 4/23 (class presentations)
    - Some people earlier than others (lottery)
- Chemicals and Waste
  - Bill Eberle has Chemical inventory (x2-8973, Eberle@colorado.edu, Ekeley M240)
  - Can buy additional chemicals if needed (~$50 / group)
  - In proposal you should report the amount of waste that you will to generate
    - Managing waste is part of the grade

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Questions?

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