

# Intro / Discussion of Student Choice Experiments

CU- Boulder  
**CHEM-4181**  
Instrumental Analysis Laboratory

Prof. Jose-Luis Jimenez  
Spring 2007

*Notes will be posted on course web page*

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## Business Items

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- Recruitment of Learning Assistants for Fall'07
- NO class on Monday Mar 5<sup>th</sup>
- Next class is Monday Mar 12<sup>th</sup>
  - Maybe also Wed Mar 14<sup>th</sup> if needed
- Will send email with these dates
- Many labs being turned in late
- Quality of labs / writing poor in some labs
  - Can get bonus points by improving a lab with the writing center
    - Lab that has been turned in & graded
    - Turn in a revised version after working with WC
    - Can do it for 1 lab per group

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## Student Choice Experiments

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- Capstone for the course
  - You've learned the techniques on the 8 prepared experiments
  - Now it is time to find an analysis problem and apply a technique or combination of techniques to get an answer
    - Choose a chemical analysis problem to address
    - Formulate a hypothesis to test
    - Design an experiment to test the hypothesis
    - Conduct the experiment
    - Analyze the results
    - Submit a final report.
  - Reminder: only course instrumentation can be used. You can't use instruments available to you elsewhere (research lab, company, etc.)
- Typically the challenge is for students to find and define a feasible analysis problem

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## Tips for Student Choice Experiments I

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- March 21 to April 21
  - Spring Break (March 26-30)
  - Last lab day is April 21, need to check out
    - No grade if waste is not disposed of (acc. EPA regulations)
  - Presentations April 23-May 4
    - Some groups will go much earlier than others (randomly)
- Prefer groups of 2, will allow individual projects
  - Groups can combine people from different sections
  - NO extra credit for doing it alone
- You shouldn't try to cure cancer in 3 weeks
  - Feasible experiments!
  - A relatively complex analysis
  - A simpler analysis, but done more times, thinking about your data
    - E.g. Cd in soil vs. distance to roadways

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## Tips for Student Choice Experiments II

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- Can't propose the same as one of 8 labs
  - Even if thinly disguised
- No biohazards (blood, urine, etc.)
- No large costs (> \$100)
- Avoid very complex matrices, extractions
- Many SCP have data which is statistically very poor
- You can come Tue, Wed, Thu (no matter what group you were in)
  - TAs will keep schedule for instruments (GC-MS)
- Check that your instrument can do what you are proposing to do
  - Manuals, TAs, Bill Eberle, Jose
    - Some manuals posted on class webpage, others available in lab

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## Reminder of Procedure and Dates

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- By **10:00 AM Mon Mar 12**: email to TAs & Jose w/ groups
- By **9:00 AM Fri Mar 16**
  - email sent to TAs & Jose, explaining your idea
  - We will give you feedback about whether idea is ok, or if you need to find new one
- By **9:00 AM Wed Mar 21**
  - 2-3 page proposal sent electronically to TAs & Jose
    - 1 page introduction/motivation:
      - Question / hypothesis
      - Sample collection and storage
      - Properly cite AT LEAST 1 journal article
    - 1 page on analytical procedure & instrument
      - Properly cite AT LEAST 1 journal article
    - 1 page on chemicals needed, safety aspects, and waste generated
  - We will review the proposals and inform you of problems

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## Some examples from last year

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- Formaldehyde in foods and its effect on L-arginine
- Heavy metal concentrations in lettuce vs. chewing tobacco
- Mobilization and plant uptake of metals as a result of acid rain
- N concentration in Dave's garden before and after adding fertilizer
- Caffeine and theobromine in several brands of chocolate
- Ag in snow from cloud seeding
- Acrylamide in food by GC-MS
- *These are examples, not a list to choose from!*

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## Points for Student Choice Exp (210/870)

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- Proposal: 20 points
- Creativity of your experiment: 20 points
- Effort you put forth to complete your project: 25 points
- Final report on project: 100 points
  - Format shown in the example report (see page 66).
- In-Class presentation (10-minute): 45 points
- Fun of solving a problem through chemical analysis: priceless

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## EXAMPLE STUDENT CHOICE REPORT

### Determination of Cadmium Concentrations in Cigarette Tobacco by Atomic Absorbance

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Performed and written by two students in the Spring 2000 class

Experiment performed April 4 through April 13, 2000

The purpose of this experiment was to determine the cadmium concentrations in cigarette tobacco using atomic absorbance, as well as to determine if there was a correlation between the cadmium concentrations and the advertised tar levels. The mass of tobacco from ten cigarettes (without the paper or filter) was measured and then digested in 50±1mL of concentrated nitric acid for one hour. The resulting solution was vacuum filtered and diluted with 1:1 concentrated nitric acid:distilled water to a final volume of 50.00±0.05mL. The samples were then analyzed by atomic absorbance at 229.3nm with a bandwidth of 1.0nm. The cadmium concentration in cigarettes was determined to be  $(6.7±0.6) \times 10^{-7}$ g/g, which corresponds to  $(4.1±0.4) \times 10^{-9}$  mol/cigarette. The concentration in cigarettes is approximately three times above the literature range, which indicates that the literature values could be outdated (since they were recorded in 1988) by environmental changes, cigarette production changes, or brands of cigarettes used. It can also be concluded that cadmium concentrations are not dependent upon advertised tar levels.

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## Clicker Question

- Do you already have an idea for your student choice project?
  - A. Yes
  - B. Partially
  - C. No

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