

INSTRUMENTAL ANALYSIS LAB (CHEM 421)
HIGHLY TENTATIVE SYLLABUS
SPRING 2007

INSTRUCTOR: Dr. Will Wickun

OFFICE: SCI 215 (phone: 657-2027; e-mail: wwickun@msubillings.edu)

TEXT: Principles of Instrumental Analysis, 6th ed., Skoog, Holler, and Crouch (2007)

MATERIALS: (a) approved lab notebook

PHILOSOPHY OF COURSE: A semester of familiarization with the major instruments in the ~~modern~~ chemistry laboratory. The class will be conducted entirely in the labs where the instruments are located and, moreover, may serve as a practical opportunity for "hands-on" experimentation and possible minor research projects in the time allocated. Within limits, students are strongly encouraged to develop their own initiative in exploring the fullest capabilities and applications of each instrument. Also, we have some computer simulation programs for use on the computer. These will allow you to get a good "feel" for interpretation of FTIR, mass, NMR, and C-13 NMR spectra.

TENTATIVE SCHEDULE: I will endeavor to precede each lab experiment with the specific theoretical introduction in the lecture. The scheduling of lab activities is contingent upon the availability of instrumentation at Northern Labs and time constraints.

<u>Date</u>	<u>Method</u>	<u>Activities (performed in sequential order)</u>
Tuesday 2/6	ICP	Tentative visit to Northern Analytical Labs
Tuesday 2/20	GC	Tentative visit to Northern Analytical Labs
Tuesday 3/1	MS or GC/MS	Tentative visit to Northern Analytical Labs
Tuesday 3/15	Colorimetry	Tentative visit to Northern Analytical Labs
Tuesday 4/3	FTIR	IR spectroscopy in our labs

COURSE WRITING REQUIREMENT: This course there is a minimum of four lab notebook reports. Notebooks will be graded upon the criteria of scientific soundness, quality of empirical results, format, grammar, spelling, and scientific writing style.

GRADING: Lab Notebooks (5 x 40 points) 200 points

CHEM 421
LAB REPORT CHECK LIST

The following condensed check list is to be used in preparing lab notebooks for this course. In writing your report, make your responses as concise and as specific as possible.

TOPICS TO BE ADDRESSED IN LAB NOTBOOK (if applicable):

- Statement of analytical problem including information desired.
- Brief overview of method used to determine the analyte. State make and model of instrument used. (Be brief here - be sure to include any changes to the procedure!)
- The methods, if any, used to standardize quantitative samples (e.g. internal standards, calibration curve, standardization titrations)
- Description of sample matrix including any potential interferences.
- Description of physical procedure used to prepare sample. (e.g., drying, grinding)
- Chemical manipulation of sample to obtain analyte or its' derivative, including relevant balanced chemical equations.
- Procedures for storing samples and standards if not used immediately.
- Time estimated to complete one analysis.
- Table(s) of all relevant data with labels and units. (Never list data in the text!)
- Mathematical relationship used to obtain quantitative results from data (e.g., the Beer-Lambert law) Show one calculation in its' entirety; all subsequent iterations may be abbreviated.
- Statistical methods used to verify results. (Correct/complete? Calculate at least the average and the standard deviation.)
- Conclusion (Simple statement addressing #1 above. e.g.: "ICP-MS sample # 3 - 27 contains Cr, Cu, and Pb", with supporting information.
- Block diagram of the major operations of the analytical procedure. Indicate the step(s) that would most likely limit the precision of the results. Discuss possible errors in fullest possible detail.
- Citation of all references to the literature used in preparing this report, including your textbook: Douglas A. Skoog, F. James Holler, and Stanley R. Crouch, *Principles of Instrumental Analysis, 6th edition*. Belmont, CA: Thomson Brooks/Cole Publishing, 2007.

GENERAL COMMENTS ON THE CHECK LIST

By responding to the above check list, you, as the analyst should become more fully aware of the possibility of **error**. Any of the operations or steps can contain sources of error. The cumulative results of these errors, which can be systematic and random, will affect the final result of the entire analytical process. The phrase, "a chain is no stronger than its weakest link," is applicable to the analytical process. Identification of the "weakest link" in the "chain" of operations composing the total analysis is important to the evaluation of any analytical procedure and the results obtained from it.

ADDITIONAL CONSIDERATIONS FOR LAB REPORTS:

1. Descriptive title for the report? (Not, e.g., Experiment #1)
2. Date(s) analysis was performed? Date report was written?
3. Pages numbered?