CHM 320: Analytical Chemistry

Spring 2009

Northern Arizona University,

Department of Chemistry & Biochemistry

Sequence No.	Time
5274	MWF 11:30 – 12:20

Instructor: Dr. Jani C. Ingram

Office: Chemistry Rm 219 Phone: 928-523-7877

Email: Jani.Ingram@nau.edu

Office Hours: **Wednesday 10:30 to 11:20 am**

Friday 8:30 am to 9:20 am

or BY APPOINTMENT

Prerequisite: CHM 152 or CHM 230 – Concurrent enrollment in CHM 320L is recommended.

Course Description:

Description – An introduction to the principles and practices of chemical analysis, with an emphasis on stoichiometry and equilibrium calculations will be presented.

Assessment of Student Learning – Assessment of learning outcomes will be based on three 1-hour exams and a comprehensive final exam (2 hours). Exams will be primarily short answer and problem solving exercises, but may include multiple choice problems. Students will be required to write equations, perform calculations, and/or explain why a given physical or chemical property is observed. Homework will be assigned, collected, and graded.

Texts & Calculator: Quantitative Chemical Analysis, 7th Edition, Daniel C. Harris, 2007

Solutions Manual for Quantitative Analysis, 7th Edition, Daniel C. Harris, 2007
You will need a "scientific calculator" (ln x, ex, log x, 10x) for the homework and exams.

Reading: You will be held accountable for the reading assignments (text, specific literature, etc.).

Important Dates:

February 11	First Exam
March 13	Second Exam
April 24	Third Exam
May 6	Final Exam (10 am to 12 pm)

Grading Policy:

Homework - Homework assigned from problems in the text book will be assigned, collected, and graded at the end of each chapter. At the end of the semester, your homework score will be normalized to 100 points (**the equivalent of one hour exam**) by dividing your total homework points by the maximum total points possible for all the collected homework sets. The homework will be collected on the Friday of the week we finish the chapter unless noted otherwise. There will be a 10% late penalty for each class period that a homework set is turned in late (up to 3 class periods).

Exams – Three 60 minute exams will be given during class Each exam will count 100 points.

The Final Exam will count 150 points.

Missed Homework and Exams – In most cases, no points or make-up exams will be given for homework more than 3 class periods late or missed exams. Institutional excuses and documented illnesses will be considered on an individual basis. If an absence was for illness, family emergency, religious holiday, or institutional excuse (University sponsored trip) AND if the instructor was notified BEFORE the absence, then arrangements can be made to take the exam or the homework will be accepted late and graded without penalty. If the instructor is NOT notified in advance, a zero will be recorded. Please note that a medical or dental appointment (except in an emergency) is not an acceptable reason for missing an exam.

Grading Scale -

Homework (normalized)	100 pts
Exams (3 @ 100 pts each)	300 pts
Final Exam	150 pts
Total Points Possible	550 pts

A > 90% B 90% to 80% C 79% to 70% D 69% to 50% F < 50%

Attendance – Your attendance as a participant in this course is not required, but is necessary for your success in learning analytical chemistry.

Comments:
You may drop a course through the eighth week of the semester with the approval of your academic advisor. If you drop a course through the fourth week, the course is deleted from your permanent record. If you drop a course between the fourth and eighth week of the semester, a grade of W (withdrawal) is recorded on your transcripts. After the eighth week of the semester, the instructor will not approve a petition to drop this course. Drop/add is not complete until it has been processed through the Registrar's Office.

CHM 320 and the laboratory course, CHM 320L, are separate courses. Dropping CHM 320 does not automatically remove you from CHM 320L (or visa versa).

Homework Chapters 0, 1, 2

Due Friday, January 16

Chapt. 0: 0-1, 0-4

Chapt. 1: 1-4, 1-12, 1-17, 1-18, 1-23, 1-28, 1-32

Chapt. 2: 2-1, 2-5, 2-7, 2-10, 2-18, 2-21

Extra Credit: Email Dr. Ingram (jani.ingram@nau.edu)
Information about yourself (major, career goals), where you are from, anything else.
Due Wednesday, January 28

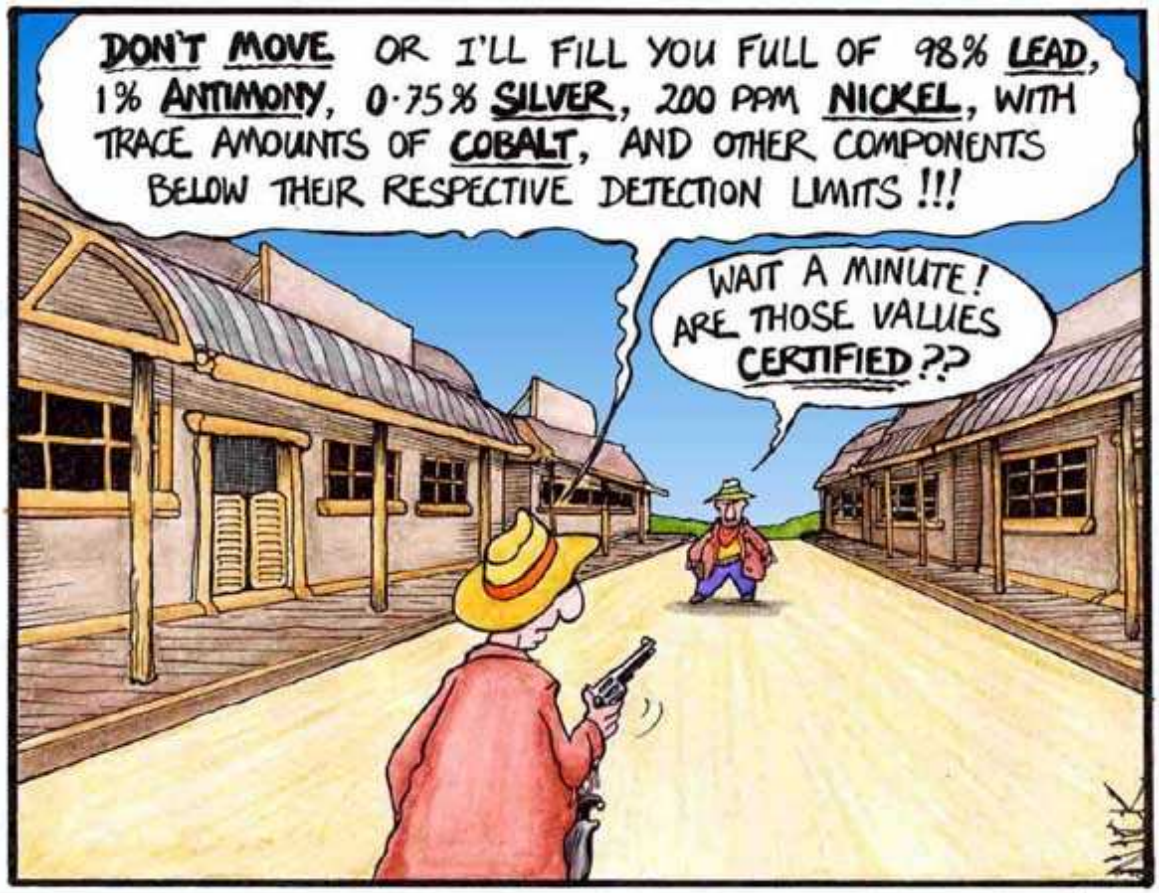
Chapter 0: The Analytical Process

How important is Analytical Chemistry?

- Provides the data needed to answer questions and test hypotheses.
- Utilized by many scientific and engineering disciplines
- A large part of what any chemist (and other scientists) does as part of their job.

STRANGE MATTER

by nick d. kim strange-matter.com



ANALYTICAL CHEMISTS IN THE WILD WEST

Definitions

- Sampling
- Homogeneous
- Heterogeneous
- Qualitative
- Quantitative
- Sample preparation
- Calibration curve
- Standards
- Species
- Analyte
- Interference
- Masking

General Steps in a Chemical Analysis

- Formulate the question or hypothesis
- Select the analytical procedures
- Sampling
- Sample Preparation
- Analysis
- Reporting and interpreting data
- Draw conclusions

20 Questions For Planning Analysis

Is measurement information required for one component or several?
Is the desired information qualitative or quantitative?
Is detailed speciation necessary, i.e. is the oxidation state or the complexed state of a given analyte essential?
What are the expected analyte concentrations?
What degree of precision is required?
What degree of accuracy is required?
What is the physical state of the samples, i.e. gas, liquid or solid?
What is the sample matrix and which of these matrix components are likely to act as interferences? The answer to the latter part of this question will define the required selectivity?
What is the total number of samples to be analyzed and how many sample analyses will be required per month, day, hour, etc.?
Economics, i.e. how much money is available for the necessary equipment and how much can be spent per analysis?
When are the data required and how much time can be spent on method development?
How much sample will be available for each determination?
What sample handling and preparation steps are necessary?
Are the sampling efficiencies known where overall efficiency = collection efficiency x recovery efficiency?
Is the analysis to be performed in the laboratory or at a field site?
Is continuous, unattended monitoring desirable? If so, what degree of equipment reliability, response stability and automation are required?
What is the level of analytical expertise of the people who will actually performing the laboratory work?
Are high purity reference standards available?
What safety practices are required, e.g. do radioactive, extremely poisonous, or carcinogenic reagents pose a safety risk?
What is the desired form of data output, i.e. analog strip chart recordings, digital printouts, floppy disk storage, internet, etc.