

# Quantitative Analysis

## CHEM 4373, Fall 2014

**Laboratory:** Thursday, 19:00 - 21:50 PM (B3506)  
**Instructor:** Jian Cui (281-283-3793), [cuijian@uhcl.edu](mailto:cuijian@uhcl.edu)  
**Office Hours:** Tuesday 11:00 am – 13:00 pm (B3525-6)  
**Graduate TA:** Prasoon Velma  
**Prerequisite:** General Chemistry  
**Textbook (optional):** Daniel C. Harris, *Exploring Chemical Analysis* 2009, New York; W. H. Freeman & Co (4th edition)

### Course Objectives

Students will (a) master the techniques, theory, and laboratory practice of quantitative chemical analysis, focusing on gravimetric and volumetric analysis;  
(b) gain an in-depth understanding of the concepts of chemical equilibrium and stoichiometry in precipitation, acid-base, complex ion formation, and oxidation-reduction reactions in aqueous solution.

### Learning outcome:

1. Upon completion of the course, students will be familiar with basic principles of all the lab courses taught in class.
2. The students will acquire basic laboratory skills associated with the analysis operation.

### Course Description

**Laboratory.** This course consists primarily of laboratory sessions which are intended to cover a variety of analytical techniques as illustrated in experiments selected from among the following examples.

- Calibration of glassware
- Gravimetric determination of calcium
- Gravimetric determination of chloride
- Fajans/Volhard determination of chloride
- Determination of sodium carbonate
- Determination of potassium hydrogen phthalate
- EDTA determination of magnesium
- EDTA determination of calcium and magnesium in tap water
- Determination of calcium using potassium permanganate

**Lecture.** Five additional short lectures (See Class Note 1-5) will be offered prior to the lab session, which are intended to provide theoretical background for the experiments by supplementing the relevant course material in General Chemistry. Major topics to be covered in lecture will be *selected* from among the following chapters.

- Introduction to chemical analysis (Chapters 0 - 2)
- Basic math and statistic tools (Chapters 3 - 5)
- Gravimetric analysis (Chapter 7)
- Volumetric analysis and precipitation titrations (Chapter 6)
- Chemical equilibria and Acid-Base titrations (Chapters 1, 8 - 10)
- Complex ion formation and equilibria, EDTA titrations (Chapter 13)

## Grading Scheme

Lab Experiments, 60 %  
Quizzes, 5 %  
Attendance, Lab Evaluation and Lab Notebooks, 5 %  
Hour Exams 1 (*Oct.16*), 15 %  
Hour Exams 2 (*Dec.04*), 15 %

## Grading rules:

1. The laboratory grade is based on the determination of unknowns, of which the grades are based almost entirely on the **accuracy of the determinations**. The analysis error within  $\pm 0.5\%$  will earn full credit.
2. A notebook is required for each student to make any laboratory records. Be neat and organized!
3. A brief lab report form, listing the results and showing the sample calculation(s), is required for each experiment. The form template will be provided.
4. Individual experiments reports are graded on a 100 point scale, typically 80 points for the analytical results/calculations, 10 points for reaction equations, significant figures, and neatness of the report, etc. An original data sheet (or a copy) is required which worth 10 points.
5. Each student is required to submit his (her) own report. Never copy your lab partner's work otherwise your grade will be zero with no excuse.
6. Students must turn in lab report (hardcopy!) before the lab starts on the due day. There will be 1 point deduction for the late-submission after the lab. There will be 2 points/day deduction for late submission (including weekend)!
7. For those late-submissions over 1 week, the report won't be accepted anymore. For any reason fail to submit the lab report, a grade zero will be given even you have done the lab.
8. There will be no make-up laboratories and/or exams for this lab course. However, you may have a chance to do the makeup with acceptable excuses (refer to Attendance Policy). The full credit for the make-up is 90% of the original. Laboratories and/or exams missed due to unexcused absences will be given a grade of zero.
9. Instead of giving homework assignments, some short quizzes (1 calculation question based on previous lab experiment, around 10 minutes) will be given to the whole class before the lab starts,

which is totally worth 5% of the final grade. Therefore, please attend the class on time. The quizzes will start at 19:00 sharp and end at 19:10 sharp. If you miss, you miss.

## LAB SAFETY

Laboratory safety is of primary importance! All students must take an online safety training session and pass the test, and must carefully read and sign a copy of the **Laboratory Safety Rules** before being allowed in lab. Students who fail to wear approved **safety glasses and lab coats** or otherwise violate important safety rules will be dismissed from lab with a grade of zero for that experiment.

**E-mail:** Although most of time instructor will post all information onto the Blackboard, such as files, reminders, etc. during the semester, you are recommended to check your UHCL e-mail in a regularly way or better check it again before class in case there is last-minute emergency call. Since UHCL security system will spam most outsider emails, the instructor will use your registered UHCL email address as the recipients for communication purpose. **Please use your UHCL emails all the time in this course**; otherwise, you will be the one responsible for any message delay caused by spam.

## Quantitative Analysis Tentative Lab Schedule Fall 2014 (Aug.25~Dec.06)

Week	Date	Lectures / Experiments	Report Due
1	Aug.28	First meet: Lab Check-In、 Glassware Cleaning and Lab safety Class Note 1: Intro topics and Gravimetric Analysis	-----
2	Sep.04	Lab 1: Calibration of Glassware	Sep.11
3	Sep.11	Lab 2: Gravimetric Cl	Sep.25
4	Sep.18	Class Note 2: Volumetric Analysis and Precipitation Titrations Lab 3: Volumetric Cl (Fajans Method)	Sep.25
5	Sep.25	Lab 4: Volumetric Cl (Volhard Method)	Oct.02
6	Oct.02	Class Note 3: Acid-Base Titrations Lab 5: Acid-Base Titration (Soda Ash Unknown)	Oct.09
7	Oct.09	No class	
7	Oct.16	Hour Exam 1 & Homework I due	
9	Oct.23	Lab 6: KHP Determination (Acid-Base titration)	Nov.06
10	Oct.30		
11	Nov.06	Class Note 4: Complex ion and EDTA titrations Lab 7: EDTA Titration (Mg Unknown)	Nov.13
12	Nov.13	Lab 8: EDTA Titration (Ca and Mg in tap water)	Nov.20
13	Nov.20	Class Note 5: Oxidation-Reduction Titrations Lab 9: KMnO <sub>4</sub> Determination of Ca	Nov.27
14	Nov.27	Thanksgiving	
15	Dec.04	Hour exam 2	

- Lecture class sessions highlighted in pink

## **Attendance Policy**

The only acceptable excuses for missing class or laboratory are:

1. An Official University Absence,
2. A written medical excuse including the physician's name and contact information,
3. A written notice from the Office of Student Life about a major personal problem such as a death in the family.

Please notify the course instructor of your excused absence in advance if possible in order to schedule a makeup in another laboratory session. Laboratories or exams missed because of excused absences will be made up as arranged with the course instructor.

## **UHCL Honesty Policy**

The Honesty Code is the university community's standard of honesty and is endorsed by all members of the University of Houston-Clear Lake academic community. It is an essential element of the University's academic credibility. It states: "I will be honest in all my academic activities and will not tolerate dishonesty." You should be aware that academic misconduct and failure to perform within the bounds of these ethical standards is sufficient grounds to receive a failing grade on assigned tasks and for recommendation for suspension from UHCL. Specific examples include, but are not limited to:

1. Cheating: copying from another student's test paper; using programmable calculators, portable computers and cell phones during the test without permission; collaborating with or seeking aid from another student during a test without permission; substituting for another student or permitting another student to substitute for oneself.
2. Plagiarism: the appropriation, theft, purchase or obtaining by any means another's work, and the unacknowledged submission or incorporation of that work as one's own offered for credit.
3. Collusion: the unauthorized collaboration with another in preparing work offered for credit.

## **6 Drop Rule Limitation**

Students who entered college for the first time in Fall 2007 or later should be aware of the course drop limitation imposed by the Texas Legislature. Dropping this or any other course between the first day of class and the census date for the semester/session does not affect your 6 drop rule count. Dropping a course between the census date and the last day to drop a class for the semester/session will count as one of your 6 permitted drops. You should take this into consideration before dropping this or any other course. Visit [www.uhcl.edu/records](http://www.uhcl.edu/records) for more information on the 6 drop rule and the census date information for the semester/session.