# CHEMISTRY 274

PRINCIPLES OF ANALYTICAL CHEMISTRY: SUMMER, 2017.

**Instructor:** **Dr. Edward Chikwana** **Email: echikwan@hawaii.edu**
**Lecture:** **BIL 242 M – F 12:00 – 1:15 PM**
**Laboratory:** **BIL 201 M – F 2:00 – 4:45 PM**
**Office Hours:** **M – F: 10:30 – 11:30 AM, other times by appointment.**

**Text Book:** **"Quantitative Chemical Analysis" Daniel C. Harris, W.H. Freeman and Company, New York, 2015, 9th Edition.**

**Prerequisites:** Make sure you have the correct prerequisites for this course. Without the proper prerequisites, it will be very difficult to succeed in this course. Recommended prerequisites are CHEM 162 or 181; MATH 215 or MATH 241 or MATH 251A, or equivalent.

The main **learning objectives** of this course are to:

- ✓ Develop an understanding of the physical principles of analytical chemistry.
- ✓ Develop an appreciation for how error analysis and statistics determine the accuracy one can expect from experimental measurements.
- ✓ Explore the role chemical equilibria play in performing chemical measurements.
- ✓ Gain an overview of the different experimental techniques used in quantitative chemical analysis.

**Course Material:** Students have been supplied with the full course syllabus for the whole summer as well as the problem sets. This allows the student to read ahead of the class. Lecture notes, assignments and solutions to the graded assignments will be posted on Laulima (https://laulima.hawaii.edu/portal). The eBook and additional resources for the class text can be accessed at www.whfreeman.com/qca9e

**Policy:** In order to facilitate a positive learning environment, **cell phones** and pagers should be turned **OFF** during lecture. If you are expecting an emergency call, let me know in advance so that you can be excused when your call comes through. Any student who is caught texting, or whose cell phone/pager goes off during class will be asked to leave the class and that class will be recorded as a missed class. **Laptops, tablets and any other portable technology can only be used in class with the instructor's prior permission.**

Regular class attendance and punctuality are mandatory. You can only miss at most **two** classes (unexcused or excused) without a grade penalty, otherwise you will **lose 1 percentage point from your total score for every day you miss class**. There will be **no** make-up lab or examinations given for students who cannot make it on the scheduled dates. If you know you are going to miss a lab or exam for a school sponsored event, you must make prior arrangements. If you miss an exam because of an emergency, you have a 24-hr grace period from the day of the exam to notify me via email (preferred) and make alternative arrangements.

**Lectures:** I will try to make lectures as interesting and attention-grabbing as possible, even if we are going over mundane chemistry principles. Summer school is very fast paced so feel free to stop me if you do not quite grasp a fact. Do not let any confusion fester, it can only grow. When I am considering borderline cases between letter grades, I will take into account the degree of classroom participation of each student. Read up the lecture notes before the next lecture, and ***make sure to review concepts listed under the Review section at the beginning of the PowerPoint slides*** for each chapter as these are considered assumed knowledge. ***Sections given as Reading exercises can be examined on.***

**Revision Problems:** These are end-of-chapter problems that you are required to work on to evaluate your progress in the course. These problems will not be collected and will not be graded. Most of the exam questions will be heavily influenced by these problems and some might even look similar, so DO the revision problems! The revision problems are derived from the text (Harris, 9$^{th}$ Edition), and the solutions are given at the back of the text book. The solutions manual for the text also contains detailed solutions to all the problems in the text. Student should strive to solve the problems first before they seek the solutions manual.

**Assignments:** Students will have three separate assignments during the course of the summer session. ***Plagiarism is greatly frowned upon and any suspicion of it in your work will attain the maximum penalty.*** Assignments will be collected every other **WEDNESDAY** and graded to make up 30% of the student's grade. Complete solutions to the graded assignments will be posted online on the date the assignments are handed in. Assignments have a strict deadline for submission (due dates provided on course outline) which students should strictly adhere to. ***Any late assignment will not be graded and the record will reflect a zero***.

Make a note of the following **assignment due dates** on your calendar:

| | |
|---|---|
| **Assignment I** | **Wednesday, May 31$^{st}$** |
| **Assignment II** | **Wednesday, June 14$^{th}$** |
| **Assignment III** | **Wednesday, June 28$^{th}$** |

**Exams: (***NO EARLY, LATE, OR MAKE-UP EXAMS WILL BE GIVEN***)**
There will be three, hour-long exams (**see dates below**) that will make up 70% of your grade. The progress exams will not be cumulative but will include concepts covered since the previous exam. You will be allowed to bring one-page (1 side of A-4 paper) of "*crib notes*" containing any **equations** that you find useful to each of the exams. ***The crib notes are part of the exam, they will test your ability to identify and summarize the important concepts for problem solving and correct implementation of these concepts; as such they should be handed in with the exam.***

Make a note of the following **exam dates** on your calendar:

| | |
|---|---|
| **Exam I** | **Friday, June 2$^{nd}$** |
| **Exam II** | **Friday, June 16$^{th}$** |
| **Exam III** | **Friday, June 30$^{th}$** |

**Laboratory:** Letter grades for lab are based on more or less the same breakdown as the lecture. The grade will be based on correct determination of unknowns, accuracy and precision as well as lab notebook, among other things. Your TA is fully responsible for your lab grade and their decision is final.

**Grading Procedures:** The following weights will be utilized in determining the overall course grade:

| | |
|---|---|
| **Exams (3)** | **70%** |
| **Graded Assignments (3)** | **30%** |

Grades are based on the total of the above categories. The following percentage scores will guarantee the letter grade shown, however I may choose to revise the breakpoints downward at my discretion.

| | | | | |
|---|---|---|---|---|
| Above 92.5 | A | | Between 72.5 - 76.4 | C |
| Between 89.5 - 92.4 | A- | | Between 69.5 - 72.4 | C- |
| Between 86.5 - 89.4 | B+ | | Between 66.5 - 69.4 | D+ |
| Between 82.5 - 86.4 | B | | Between 62.5 - 66.4 | D |
| Between 79.5 - 82.4 | B- | | Between 59.5 - 62.4 | D- |
| Between 76.5 - 79.4 | C+ | | Below 59.5 | F |

**Course Outline:** ***(Subject to change, except exam dates)***

| Week | Date | Topic/Chapter/Important Dates | 9th Ed Revision Problems |
|---|---|---|---|
| 1 | May 22 | Introduction: Review & Error Analysis (Ch.1-3) ***Read Chapter 1 and 2, most of the concepts are just review and will be covered in lab.*** | 1-B, 1-13, 1-21, 1-22, 1-30, 2-17, 3-A, 3-C, 3-14, 3-15, 3-18,3-20 |
| | May 23 | | |
| | May 24 | Statistics (Ch. 4) | 4-A,4-F, 4-1, 4-12, 4-14, 4-15, 4-21, 4-22, 4-24 |
| | May 25 | | |
| | May 26 | Gravimetric Analysis (Ch. 27) | 27-B, 27-1,27-10, 27-11, 27-18, 27-20 |
| 2 | **May 29** | **Memorial Day – No classes** | |
| | May 30 | Equilibrium and Solubility (Ch. 6) | 6-C, 6-E, 6-F, 6-4, 6-19, 6-21 |
| | **May 31*** | **Graded Assignment 1 due on Wednesday.** Systematic Treatment of Equilibrium (Ch.8) | 8-F, 8-G, 8-H,8-34, |
| | June 1 | Activity (Ch.8) | 8-A, 8-C,8-D, 8-7,8-13, |
| | **June 2*** | **EXAM 1: Everything covered in class** | |
| 3 | June 5 | Acids and Bases: Types and strengths of acids and bases (Ch. 6 & 9) | 6-35, 6-36, 6-39, 6-46, 6-48, 6-49 9-A, 9-C, 9-D, 9-3, 9-6, 9-11, 9-12, 9-19, 9-23, 9-24 |
| | June 6 | Acids and Bases: Buffers(Ch. 9) | 9-H, 9-J, 9-26, 9-35, 9-38, 9-40, 9-41, 9-42 |
| | June 7 | Buffers, Polyprotic acids & bases (Ch. 10) | 10-A, 10-B, 10-5, 10-19, 10-22, 10-38 |
| | June 8 | Acids and Bases: Titration (Ch. 11) | 11-G, 11-2, 11-6, 11-8, 11-11, 11-17, 11-18, 11-31, |
| | **June 9** | | |
| 4 | June 12 | **Kamehameha Day – No Classes (Monday)** | |
| | June 13 | EDTA titration techniques (Ch. 12) | 12-A,12-B, 12-E(a), 12-32, 12-34, 12-36, 12-38 |
| | **June 14*** | **Graded Assignment 2 due on Wednesday.** | |
| | June 15 | EDTA Titration Curves | |
| | **June 16*** | **Exam 2: Everything not covered by the first exam** | |
| 5 | June 19 | Intro. to Spectroscopy (Ch.18) | 18-A, 18-B,18-C,18-3,18-7,18-12, 18-18, 18-20 |
| | June 20 | | |
| | June 21 | Introduction to Analytical Separations (Ch. 23) | 23-A, 23-C, 23-8, 23-9, 23-10 23-17, 23-18, 23-23, 23-25, 23-26 |
| | June 22 | | |
| | June 23 | Intro to Chromatography | |
| 6 | June 26 | Chromatography | |
| | June 27 | Electrochemistry (Ch.14) | 14-B, 14-C, 14-6, 14-10, 14-28, 14-29, 14-31, 14-32 |
| | **June 28*** | **Graded Assignment 3 due on Wednesday.** Electrochemistry | |
| | June 29 | Redox Titrations (Ch. 16) | 16-A, 16-E |
| | **June 30*** | **Exam 3: Everything not covered by the first two Exams** | |