

# Chemistry 442: Aquatic Chemistry

## Fall Semester 2020

**Professor:** Prof. DeGrandpre (Mike), Office: enter through lab (Chem Building 317), Office hours: drop by or arrange with me, email: [michael.degrandpre@umontana.edu](mailto:michael.degrandpre@umontana.edu). phone: 243-4118. Class is 9:30-10:45 in Chemistry 102.

**Course overview:** The course is intended for students who are interested in environmental chemistry, aquatic chemistry and applied general chemistry. From this course you will gain an in-depth understanding of: **1)** solution thermodynamics (acid-base chemistry, solubility, metal complexation, redox equilibria); **2)** the processes that control the chemistry of rivers, lakes, oceans, coca cola, blood, rain – any aqueous solution; and **3)** computational methods for deriving and solving equilibrium models. Lectures are based on the assumption that you have completed one year of general chemistry and a semester of quantitative analysis. The course will focus primarily on thermodynamic models for understanding and predicting the chemical composition of natural waters. We will use spreadsheet programs as our modeling platforms. Because of the emphasis on use of computer computations, your homework is worth 30% of your final grade.

**Required Text:** *A Problem Solving Approach to Aquatic Chemistry* – James N. Jensen, John Wiley and Sons, Inc.

|                 |                           |     |
|-----------------|---------------------------|-----|
| <b>Grading:</b> | Homework + final project* | 30% |
|                 | Exams (2)**               | 40% |
|                 | Final exam                | 20% |
|                 | Class participation       | 10% |

All final letter grades will use +/- grading.

\*The final project will be the application of a thermodynamic model derived from your homework assignments.

\*\*The graduate increment is required by the University for UG (undergrad/grad) courses. Graduate students will have an additional question on each exam to assess their depth of knowledge of the material.

| <b>Expected Lecture Schedule<br/>Chemistry 442<br/>Fall Semester 2020</b> |   |                |
|---|---|----------------|
| <b>Week</b>   | <b>Lecture subject</b>                              | <b>Reading</b> |
| Aug. 20   | course overview - review of solution thermodynamics | Ch. 1-3, 20-21 |
| Aug. 24   | solving multiple chemical equilibria                | Ch. 4-9, 20-21 |
| Aug. 31   | solving multiple chemical equilibria                | Ch. 4-9        |
| Sept. 7   | solving multiple chemical equilibria, acids/bases   | Ch. 4-9        |
| Sept. 14  | acid/bases in natural waters, buffer intensity      | Ch. 10-13      |
| Sept. 21  | acid/bases in natural waters, buffer intensity      | Ch. 10-13      |
| Sept. 28  | CO <sub>2</sub> equilibria, alkalinity and acidity  | Ch. 10-13      |
| Oct. 5  | CO <sub>2</sub> equilibria, alkalinity and acidity  | Ch. 10-13      |
| Oct. 12   | CO <sub>2</sub> equilibria, alkalinity and acidity  | Ch. 10-13      |
| Oct. 19   | metal ion equilibria, solubility, complexation      | Ch. 14-15, 19  |
| Oct. 26   | metal ion equilibria                                | Ch. 14-15, 19  |
| Nov. 2  | redox equilibria, pE                                | Ch. 16         |
| Nov. 9  | redox equilibria, pE                                | Ch. 16         |
| Nov. 16   | contemporary problems in aquatic chemistry          | literature     |
| Nov. 23   | review, final 10:10 Nov. 25                         | literature     |

#### Covid-related statement

- Mask use is required within the classroom
- The expectation is that students will clean their personal work space when they arrive for class, and before they leave the classroom
- Students should not congregate outside the classroom before and after class
- Specific seating arrangements will be used to ensure social distancing and support contact tracing efforts
- Drinking liquids and eating food is discouraged within the classroom (which requires mask removal)
- Stay home if you feel sick and/or if exhibiting COVID-19 symptoms
- Up-to-Date COVID-19 Information from the University of Montana
  - UM Coronavirus Website: <https://www.umt.edu/coronavirus>
  - UM COVID-19 Fall 2020 website: <https://www.umt.edu/coronavirus/fall2020.php>
- We encourage students to remain vigilant outside the classroom in mitigating the spread of COVID-19

