

UCLA School of Public Health
EHS 261
Chemical Behavior of Aquatic Systems

Course Syllabus – Winter Quarter, 2017

<u>Dates in 2017</u>	<u>Subject</u>
Jan 9-11	Principles of water chemistry and quality
Jan 16	holiday
Jan 18-23	Chemical equilibria
Jan 25	Acids and bases
Jan 31-Feb 2	Dissolved carbon dioxide
Feb 6-8	Precipitation and dissolution
Feb 13	Mid-term
Feb 15	Metal ions in aqueous solution
Feb 20	holiday
Feb 22	Metal ions in aqueous solution
Feb 27-Mar 1	Oxidation reduction
Mar 6-8	Solid solution interface
March 13-15	Regulation of chemical composition of natural waters

Reading List

The reading list evolves during the course according to classroom discussion, questions posed by students, etc.

The standard reading list is as follows:

1. *Aquatic Chemistry* by Werner Stumm and James Morgan. Wiley-Interscience, 3rd edition, 1996.
2. *Aquatic Chemistry* by Werner Stumm and James Morgan. Wiley-Interscience, 2nd edition, 1981.
3. *Chemistry of Water Treatment* by Samuel Faust and Osman Oly. CRC Press, 2nd edition, 1998.
4. *Solutions, Minerals and Equilibria* by Robert Garrets and Charles Christ. Harper and Row, 1st edition, 1965.

5. *Standard Methods for the Examination of Water and Waste Water* by the American Public Health Association, the American Water Works Association, and the Water Environment Federation. 2012.
6. *Global Environment: Water, Air, and Geochemical Cycles* by Elizabeth Berner and Robert Berner. Princeton University Press, 2nd edition, 2012.

The 3rd edition of Stumm and Morgan (listed above) is the primary text for the course. The course outline follows their topics and chapters.

Learning Objectives

The goals of the course are to provide an understanding of aquatic chemistry principles to public health students and those from other engineering programs on campus. The principles include the understanding of acid-base chemistry as applied to the study of water resources; the dissolved carbon dioxide equilibria and applications; the understanding of precipitation and dissolution in natural waters along with studies of oxidation and reduction; regulation of chemical qualities of waters; and other aspects of water chemistry. The reading list for the course is given above and incorporates some of the newer texts and treatises on the subject. Field trips to various water agencies and treatment plants will be considered. The trips will help to visualize applications of chemical principles to water bodies and technology operations in supplying potable and other treatment effluents. Students enrolled in Public Health, Environmental Health, engineering fields, or chemistry are considered appropriate enrollees to the course.

Core Competencies

The goals for learning objectives and core competencies for the course EHS 261 are as described below.

The course strives to incorporate chemistry principles and those biological sciences in the understanding of the way systems work in the aquatic environment. Students completing the ten-week course should be able to:

- gain an understanding of the chemical principles to determine chemical species in water systems using thermodynamics and chemical kinetic techniques;
- gain an appreciation of the dissolved carbon dioxide effects in natural waters;
- gain an understanding of soil systems and their contributions to dissolved carbon dioxide in natural waters as well as the contributions derived from overland air masses;
- gain an appreciation of metal ions and organic compounds and chelates in natural and anthropogenic contributions to water bodies;
- gain an understanding of solid-solution interfaces, origin of charged surfaces and effects on chemical fate and transport through water bodies and soil systems;

Core competencies in the above knowledge objectives will be developed through the application of mathematical and analytical chemical principles to the aquatic chemistry discipline. Familiarity with other water chemistry programs on campus and

at local academic institutions will be pursued through seminar attendance, program visits, and field orientation with local governmental agencies.