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CHMY 541.01: Environmental Chemistry

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Chemistry 541-Syllabus

Environmental Chemistry

Spring Semester 2013

Instructor: Dr. Chris Palmer, Chem Bldg 203A, x4079, christopher.palmer@umontana.edu

Office hours: Mon. and Wed. 1-3 and by appointment.

Texts: *No text is required for this course.* I will take material from:

Principles of Environmental Chemistry, James E. Girard, Jones and Bartlett, 2005;

Fundamentals of Environmental Chemistry, 3rd Ed., Stanley E. Manahan, CRC Press, 2009;

Environmental Chemistry, 8th Ed., Stanley E. Manahan, CRC press, 2005;

Environmental Chemistry, 5th Ed., Colin Baird and Michael Cann, 2012.

I will also use information from published papers, and will give you the citations when I do.

Learning Outcomes: Environmental Chemistry is a vast and broad topic that includes the chemistries of land, water and air, and the interaction of chemicals with plants and animals (including humans) in the environment. A one semester course can not cover all of the topics in any real detail. Instead, this course will give an overview of important chemistries of the earth, water and air. The course will present natural chemical processes in the environment and use specific examples of anthropogenic impacts on the chemistry of the environment. The purpose of this course is to **1)** establish an understanding and appreciation of environmental chemical processes and their complexities, **2)** develop a working knowledge of the chemistry involved in specific environmental challenges, **3)** develop a familiarity with commonly used measurement techniques for the study of environmental chemistry, and **4)** provide a familiarity with current research in environmental chemistry. Having completed this course, the student should be able to read the literature describing studies of environmental chemistry and should be better prepared for more in-depth studies of specific environmental chemistries (e.g. atmospheric chemistry).

Background: It is assumed that students have an undergraduate level knowledge of physical chemistry (thermodynamics and kinetics) as well as a familiarity with chemical names, structures and notations, chemical reactions and stoichiometry, and chemical reactivity. Students should have a working knowledge of equilibrium chemistry, and acids and bases. Students are also expected to have a basic working knowledge and understanding of spectroscopy.

Course Organization: Approximately the first two thirds of the semester will be taught in the traditional lecture format. During this period, the fundamentals of various areas of environmental chemistry will be covered, along with examples of the chemistry of specific environmental issues. Following this period there will be a written exam. The final four weeks of the semester will be used for invited lectures from local researchers conducting research in environmental chemistry. Those speakers will provide the students with a recent manuscript and will come to class for a lecture and discussion of the research in the manuscript. Students will be expected to read the manuscript and come to class prepared to discuss the research. Students will write a ~ ten page paper on one or more of the research topics presented, expanding on the discussion to include

work published by other researchers. There will be a comprehensive final exam covering the fundamentals and specifics of the research presentations.

Grading: Grades will be on the +/- scale (A,A-,B+, etc) with the following breakdown:

Midterm Exam	20%
Homework Questions and Problems	15%
Preparation and Participation in Discussions	15%
Final Exam	20%
Research Paper	30%

Academic misconduct is subject to an academic penalty by the course instructor and/or disciplinary sanction by the University. Academic misconduct is defined as all forms of academic dishonesty. All of the academic policies found in the Student Conduct Code (http://life.umt.edu/vpsa/student_conduct.php) apply to this course.

Of particular relevance to this course, it is considered academic misconduct to represent another person's words, ideas, data, or materials as one's own. It is also considered academic misconduct to copy from another student's paper, consult unauthorized material, give information to another student or collaborate with one or more students without authorization during an examination or academic exercise without the instructor's permission.

Students with Disabilities

If you are a student with a disability and wish to discuss reasonable modifications for this course, contact me privately to discuss the specific modifications you wish to request. Please be advised I may request that you provide a letter from Disability Services for Students verifying your right to reasonable modifications. If you have not yet contacted Disability Services, located in Lommasson Center 154, please do so in order to verify your disability and to coordinate your reasonable modifications. For more information, visit the Disability Services website at <http://www.umt.edu/disability>.

Important Dates Important dates and deadlines regarding registration for the fall semester can be found at

<http://www.umt.edu/registrar/calendar.aspx>

Lecture Schedule:

Jan 29-31: Introduction and overview, Relevant chemical concepts, Cycles

Part I: The Lithosphere

Feb 5: Chemical composition of earth and soils

Feb 7-12: Agriculture and mineral resource development

Part II: The Atmosphere

Feb. 14: Layers of the atmosphere and their chemical composition

Feb. 19-21: Photochemical smog and particulate matter

Feb. 26-28: Greenhouse gasses and climate change

Mar. 5-7: Ozone depletion and the ozone holes

Part III: The Hydrosphere

Mar. 12-14: Chemistry of Natural Waters: pH and Redox Chemistry

Week 8: No class Mar. 19. **Exam I Mar. 21**

Mar. 26-28: Water pollution: Acid rain, Acid mine Drainage.

Spring Break: April 1-5

Apr 9, 11: Water Treatment and management of water resources

Part IV: Special Topics

Apr 16-18: Mike Degrandpre: Carbon Cycle in Aquatic Systems/Ocean Acidification

Apr 23-25: Tony Ward: Asbestos/Particulate Matter

Apr 30: Bob Yokelson: Biomass burning emissions chemistry

May 2: Kent Sugden:

May 7-9: Ed Rosenberg: Environmental remediation/Selective extraction of metals