

Geochemistry

ERTH325

TR 9.00pm-10.15pm

POST 708

Instructor: Jasper Konter

Office: POST 607

Office Hours: TBA, or by appointment

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*Note: Email is the best way to contact me and should provide the most timely response

Website: Please check Laulima, I stopped using the html page

Prerequisites: EARTH200, MATH 241 or 251A, CHEM 162 (or concurrent); or consent

Corona disclaimer: the class is scheduled to be in-person, but this is based on the current level and trend of COVID infection in Hawai'i. If this changes significantly, the content will remain the same, but assignments and course delivery will be modified, as necessary.

Course Description: This course focuses on the chemistry of the natural world and the chemical evolution of the Earth over geological time. We will discuss practical and theoretical geochemistry, with an emphasis on how chemical principles are used to study Earth Sciences. The course is composed of a three modules: (a) geochemical fundamentals; (b) natural and anthropogenically perturbed aspects of the Earth's hydrosphere and its interaction with surficial rocks, sediments, soils, the biosphere and the atmosphere and (c) the origin and evolution of Earth (crust-mantle-core) and the solar system through nuclear and high temperature chemical processes.

Geochemical Fundamentals

- The Elements; basic principles of inorganic chemistry, periodic properties
- Thermodynamics and chemical reactions, solubility
- Aquatic Chemistry, pH-pE, Biology and redox
- Organic Chemistry

Low temperature geochemistry

- Chemical Processes, Photosynthesis/respiration, Aquatic Microbial Biochemistry in rain, rivers, lakes, estuaries
- Chemical weathering, soil formation, geochemistry of clays.
- The oceans, marine chemistry, primary productivity, Gaia, Marine Sediments: a record of environmental global history, light isotope geochemistry.
- Global Climate: Present and Future, atmospheric CO₂

High temperature geochemistry

- Age and Origin of the Solar System.
- Planet formation, differentiation of the Earth.
- Igneous processes
- Radiogenic isotope geology/Geochronology

ERTH Learning Objectives:

The Earth Sciences department has defined 5 learning objectives for the undergraduate degree program related to Relevance of Earth Sciences, Technical knowledge, Scientific method, Oral and written skills, and Evaluating Phenomena.

- Students can explain the relevance of geology and geophysics to human needs, including those appropriate to Hawaii, and be able to discuss issues related to geology and its impact on society and planet Earth.
- Students can apply technical knowledge of relevant computer applications, laboratory methods, and field methods to solve real-world problems in geology and geophysics.
- Students use the scientific method to define, critically analyze, and solve a problem in earth science.
- Students can reconstruct, clearly and ethically, geological knowledge in both oral presentations and written reports.
- Students can evaluate, interpret, and summarize the basic principles of geology and geophysics, including the fundamental tenets of the sub-disciplines, and their context in relationship to other core sciences, to explain complex phenomena in geology and geophysics.

This course directly incorporates content relevant to 4 of those:

- SLO1 - throughout the course you will learn about the relevance of geochemistry to understanding and providing for human needs, and to impacts on society and planet Earth.
- SLO2 - you will solve problems using real world data sets
- SLO4 - you will reconstruct knowledge in a written report (final project).
- SLO5 - in all assignments you will evaluate, interpret, and summarize basic principles to explain complex phenomena at the interfaces of chemistry, geology, biology, hydrology, soil science, geography and human industry.

Course Goals:

This class is about using chemical information and chemical reasoning to better understand geological, hydrological and biological process and their interplays on Earth. We will use quantitative and qualitative approaches to learn how the compositions of Earth materials constrain active processes and Earth history.

Textbook:

We will use the book by William White on Geochemistry. Although you are welcome to purchase your own copy, pdf chapters of a pre-publication version will be made available through the website. Other background reading may also be provided as needed through the semester.

Laboratory: There is no separate lab component for this class; however, there will be exercises and/or problems that you will need to turn in for a grade.

Attendance: Not all the material discussed in class will be in the book, so it is important to participate in class. To encourage attendance, there will be a “Question of the day”.

Grading Policy

Grading (see below for more information on grading policy, etc):

Work handed in	20%
Question of the Day	10%
Basics Test	10%
Mid-Term Exam	30%
Final Project	30%

Letter Grade Breakdown: A = 90%+; B = 80 – 89%; C = 70 – 79%; D = 60 – 69% ; F = < 60%

Homework

There will be occasional work to be handed in, and not all of it will be finished during class time. In addition, you will need to work on your final report outside of lecture times. All work handed in should be readable, (consider typing), and correct grammar and spelling will be appreciated. Deductions will be made for ambiguous or incomprehensible text.

Working Together on Homework: Studies have shown that students learn best when they work together. I encourage you to work with each other on assigned problems. However, each student must turn in their own assignment, written using their own words. In case of identical answers between different students, neither student will receive any credit for that particular question – see academic honesty below.

Academic honesty and integrity

University guidelines for acceptable student conduct are very specific and will be strictly followed. Please read the guidelines (<http://www.catalog.hawaii.edu/about-uh/campus-policies1.htm>) and contact your instructors if you have any concerns. Academic dishonesty will be reported, and any exams or assignments affected by dishonesty will receive “0” credit and cannot be retaken.

Question of the day

We will set up a schedule, where one-by-one each student will have to come up with a review question covering the material of the previous lecture. The rest of the class will have to answer, and we will discuss the question and the student that designed the question will explain the answer. The question will need to be emailed to the instructor the day before, and will be posed at the beginning of the lecture.

Midterm

There will be one midterm exam, which will be in essay format, unless the class size does not allow that.

Final project

We will have a final project in lieu of a standard final exam. A written report will have to be submitted for this component (likely be email).

Make-Up Exams/Early Exams

Make-up exams will not be given except when a student misses the exam for a legitimate reason such as illness or family emergency (a doctor's note is required in the case of illness). Please contact me as soon as possible if such a situation arises. Anyone with official UH-sponsored event conflicts (e.g. UH sports teams) must provide at least 2 weeks notice with appropriate signed paperwork.

Note that make-up and/or early exams will be essay format and may be substantially more difficult.

Dropping this class – deadline reminders

You will need to drop the class by filing appropriate paperwork: non-attendance will not result in being dropped, but you will get zeros for the remaining work and consequently fail the class.

Students with Disabilities:

The Earth Sciences Department will make every effort to assist those with disability and related access needs. For confidential services, please contact the Office for Students with Disabilities (known as “Kokua”) located in the Queen Lili'uokalani Center for Student Services (Room 013): __
KOKUA Program; 2600 Campus Road; Honolulu, Hawaii 96822__
Voice: 956-7511; Email: kokua@hawaii.edu;_ URL: www.hawaii.edu/kokua

Title IX:

The University of Hawai'i is committed to providing a learning, working and living environment that promotes personal integrity, civility, and mutual respect and is free of all forms of sex discrimination and gender-based violence, including sexual assault, sexual harassment, gender-based harassment, domestic violence, dating violence, and stalking. If you or someone you know is experiencing any of these, the University has staff and resources on your campus to support and assist you. Staff can also direct you to resources that are in the community. Here are some of your options:

As members of the University faculty, your instructors are required to immediately report any incident of potential sex discrimination or gender-based violence to the campus Title IX Coordinator. Although the Title IX Coordinator and your instructors cannot guarantee confidentiality, you will still have options about how your case will be handled. Our goal is to make sure you are aware of the range of options available to you and have access to the resources and support you need.

If you wish to remain ANONYMOUS, speak with someone CONFIDENTIALLY, or would like to receive information and support in a CONFIDENTIAL setting, use the confidential resources available here: <http://www.manoa.hawaii.edu/titleix/resources.html#confidential>

If you wish to directly REPORT an incident of sex discrimination or gender-based violence including sexual assault, sexual harassment, gender-based harassment, domestic violence, dating violence or stalking as well as receive information and support, contact: Dee Uwono, Title IX Coordinator, (808) 956-2299, t9uhm@hawaii.edu.