F D '01

MARINE SCIENCES:
CHEMICAL PERSPECTIVES (CH 107)
COURSE OUTLINE
FALL SEMESTER 2001

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Required Textbook: Pinet, Paul *R Invitation to Oceanography*, 2"d Ed., Jones and Bartlett Publishers, Sudbury, MA, 1999.

Supplementary Books:

Atkins, P. W., *Molecules,* W.H. Freeman, 1989.
Gulko, David, *Hawaiian Coral Reef Ecology*, Mutual Publishing, 1999
Atlas of Hawaii, Juvik, Sonia P. and Juvik James O., editors, University of Hawaii Press, 3rd Ed., 1998.

Web Pages: www.jbpub.com/oceanlink
Explanatory and supplementary material; on-line review quizzes

Exams and Grading: Two 45-minute midterms, class discussions and homework assignments, class project, and a ninety minute comprehensive final.

Course Grade (all grades in percentages)
_ + .30 (average of the two midterms)
+ .15 (class project)
+ .25 (average of the class discussions and assignments)
+30 (final)

Office Hours: MWF 12:00 noon - 1:00 pm and/or by arrangement

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Course Objectives:

This is a course aimed at everybody who is interested in the oceans around us. As many diverse aspects of the marine environment are discussed, a molecular perspective will be emphasized. The oceans provide a habitat to a wealth of living organisms. Human beings also share this habitat to an increasing degree, a fact which has significant ecological consequence. From a chemical point of view, the ocean is a huge flask filled with water, where many chemical reactions take place. The climactic factors are just as important as the contents of this "flask" in determining the outcome of these reactions. As for the interactions of people, these can influence both what goes on inside and outside the flask. The science/chemistry background needed to follow the course will be provided on an individual basis rather than a repetitious review of general physical sciences.

It is hoped that the course will serve as a stepping stone for all science majors or intended science majors in demonstrating the direct relevance of many scientific concepts to our immediate environment. In addition, the course will develop an awareness of current issues and offer perspectives in economics, resource management, Hawaiian and Pacific Studies, as well as aesthetics. Finally, upon completing the course students are expected to have a better understanding of the marine environment and its inhabitants as well as an overall respect for the ocean.

Week	Date	Chapter in Text	Subject
1	8/27	I	Introduction to Marine Sciences... Oceanography, Oceanology, Marine Biology/Ecology, Marine Natural Products Chemistry, Related Disciplines... Oceans as sources of inspiration...
1	8/29	2	History of Ocean Sciences... Current and future research...
1	8/31		No class: Academic Convocation
2	9/3		No class: Labor Day
2	9/5	2	The earth's structure... The fluid spheres... The ocean floor...
2	9/7	2	The physiography of the ocean floor... Ocean basins... What is unique about Hawaii?
3	9/10	3	Continental drift and sea-floor spreading... Paleomagnetism...
3	9/12	3	Plate tectonics...
			Earthquakes, Tsunamis, other disasters influencing marine environments...
4	9/17	5	The properties of sea-water: basic chemical notions, atoms, molecules, sub-atomic articles
4	9/19	Supp. Mat.	Ions: Monoatomic, of atomic... Molecules... Organic and Inorganic molecules...
4	9/21	5	Gases dissolved in seawater...
5	9/24	Su . Mat.	Scuba Diving: Physical and physiological aspects.
5	9/26	Su . Mat.	Scuba Diving: Equipment and safety... Gas laws...
5	9/28	Supp. Mat. 5	Acidity/Basicity... The carbon dioxide story... Buffering... The concept of chemical equilibrium (and further extensions to evolutionary principles)...
6	10/1	5	Physical properties of water: Heat Capacity Salinity...
6	10/3		FIRST MIDTERM EXAM
6	10/5	4	Sediments in the sea...
7	10/8		*No Class:* Discoverer's Day
7	*10/10*	6	Atmospheric processes: Movements of air, Effects of the earth's movement (The Coriolis Deflection)
7	10/12	6	Surface ocean currents...
8	10/15	6	Deep ocean circulation...
8	10/17	7	Ocean waves...
8	10/19	7	Properties of waves and wave mechanics... Tsunamis...
9	10/22	7(8) Su . Mat.	Tide/Wave relationships... Ocean waves and recreation: Surfing
9	10/24	Su . Mat.	History and culture of surfing in Hawaii... Surfboards...
9	10/26	Su . Mat.	Shaping and repairing surfboards... Polymers...
10	10/29	Supp. Mat.	Comparison of small and large molecules... Linkages between molecules... Monomeric units... Biological polymers...
10	10/31	8	Tides: Origins and Movements...
10	11/2	9	Marine Ecology: Marine habitats, Classification of marine organisms...
11	11/5	9 (10)	Adaptive strategies... Symbiotic relationships... Photosynthesis...
11	11/7	9	Chemical communication and Defense mechanisms...
11	11/9	Su . Mat.	"Good chemists" among marine organisms...
12	11/12		*No* Class: Veteran's Day
12	11,114	Su . Mat.	Marine natural products... Chemist and ecology hand in hand...
12	11/16		*SECOND* MIDTERM EXAM
13	11/19	10	More on photosynthesis... Oceans as chemical media
13	11/21	10	Chemical and environmental efficiency in the oceans... Mixing in the ocean...
13	11/23		No Class: Thanksgiving Break
14	11/26	11 (12)	Shorelines: Beaches, Coastal dunes... Shorelines of the Hawaiian Islands: Coral reefs and other coastal habitats...
14	11/28	11	Impact of people on shorelines... Environmental pollution...
14	11!30	(15)	Larger inhabitants of the ocean: Marine mammals... Interactions between people and oceans... Marine mammals in captivity...
15	12/3	(14)	Ocean recreation... Boating...
15	12/5	Sup . Mat.	Basic boating skills... Navigation...
15	12/7	Supp. Mat. 14	Safe boating... Equipment... Law of the sea
	12/12		FINAL EXAM (Wednesday: 10:30)

MARINE SCIENCES: CHEMICAL PERSPECTIVES
LAB (CH 107L)
COURSE OUTLINE
FALL SEMESTER 2001

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Objectives:
The main objective of this lab course is to introduce students to hands-on experience in marine sciences. Since most experimental work in this area involves work in the field, there will be a number of field trips to ecologically unique areas as well as to research institutions, where the students will observe and/or collect various marine organisms. Experience in isolation and separation techniques will provide the students with the skills necessary in the preservation and the chemical analyses of marine samples.

Requirements:
Each student will keep a note-book, where the experiments will be recorded and the field trips written up. Further reports will be prepared as instructed.

Grading:
The lab grade will be based on the following criteria:

Lab note-book	25%
Lab reports	20%
Experimental results	20%
Attendance	35%

LABSCHEDULE

Week	Dates	Experiment	Reading Assignment
1	8/29	Introduction	
2	9/5	Distillation of sea-water: Density v.s. salinity correlations	Hand-out
3	9/12	Visit to Waikiki Aquarium	Hand-out
4	9/19	Underwater observations: Atlantis submarine	Hand-out
5	9/26	Dissolved gases: Ammonia fountain	Hand-out
6	10/2	Estuaries: Visit to "Alan Davis Estuary" Sample collecting, reservation, and freeze-drying	Hand-out
7	10/9	Solvent-solvent separation techniques	Hand-out
8	10/17	Underwater techniques: SCUBA	Hand-out
9	10/24	Survey of polymers (how to fix a surfboard...)	Hand-out
10	10/31	Boating	Hand-out
11	11/7	Visit to the Coast Guard Station	
12	11/14	Chemistry of sea-food: A comparison of local and world-wide recipes	
13	11/21	Underwater growth measurements	Hand-out
14	11/28	Poster presentations of project reports	Hand-out
15	12/5	Conclusion	

**the schedule may be modified in view of weather conditions*