Bio. 204-Cellular & Organismic Biology
MWF 9:00-9:50 or TR 9:30-10:50
3 semester credits
Chaminade University of Honolulu

Spring 1999
January 11, 1999 to
May 6, 1999
Instructor:
Ronald M. Iwamoto

COURSE OUTLINE AND SYLLABUS

TEXT:

McFadden, Carol H. and William T. Keeton 1995. Biology: An Exploration of Life. W.W. Norton, N.Y. N.Y.

COURSE DESCRIPTION:

Biology 204 is a 3-credit introductory biological science course for those students desiring advanced studies in the sciences, e.g. biology, forensic science, medicine, dentistry, environmental health, and other areas. It is preceded by Biology 203 in the fall semester.

The following is from the 1998-1999 General Catalog:

> Concepts of cellular and molecular biology stressed in first semester; second semester devoted to organisms stressing phylogenetic, ecological, and genetic relationships in plants and animals. Recommended for science majors.

AIMS/GOALS OF THE COURSE: This course is designed to fulfill the following goals:

1. To present the basic concepts and principles of biology for use in the present day and for future courses.

2. To prepare the student to continue into advanced biology or related fields, such as biochemistry.

3. To examine and analyze specific content areas, such as molecular or cellular biology, evolution, physiology, and related areas of biochemistry and biophysics. Cellular biology will be stressed during the first semester (Bi 203) while organismal biology, based on organ systems, will be emphasized in the second semester (Bi 204).

4. To study the organisms included in the botanical and zoological fields emphasizing Hawaiian flora and fauna.

5. To impart an understanding of the accomplishments, failures, ambiguities, and the future of the biological sciences drawing on examples and applications of principles in the area of marine sciences, biomedical sciences and other disciplnes.

OBJECTIVES FOR STUDENTS: At the completion of the course, the student will be able to do the following:

1. **Analyze a scientific problem using principles and methods used in the natural sciences.**

2. **Use biological science terminology to communicate principles and concepts of biological content areas.**

3. **Provide examples and applications of principles and concepts of** cells, **systems, and living organisms.**

4. **Give examples of Hawaiian flora and fauna.**

LECTURES:

1. **Lectures are** either **50 minutes duration, three times per week or one hour and twenty minutes duration, twice per week for approximately 15 weeks. Lectures are accompanied by a single laboratory period of 3 hours duration per week.**

2. **Text assignments and lecture topics are** listed **in the course outline. Consult the outline for assignments, announced quizes and exam dates, and holidays.**

3. **Supplemental readings may be assigned during the course of the semester.**

4. **Supplemental reference texts are on reserve in the library at the front desk and will include study guides with sample exam questions. These may be used for additional** readings, references for lab reports, or for an **alternative approach to your text. Please complete required assignments before using supplemental references.**

5. **Adjustments may be made to the lecture outline, such as changes in exam dates, or assignments due to conference trips.**

GRADE DETERMINATION:

1. **Separate grades will be given for lecture and laboratory. It is therefore, possible to receive different grades for lecture and laboratory.**

2. **Quizes, both announced and unannounced, will be given during the semester. At the end of the semester, the student may substitute the total quiz score average, based on 100x, for one of the** lower **scored lecture exams, not including the final exam.**

GRADE DETERMINATION CONT'D...:

3. **Each student will submit 5 summaries of current events in biology. Each summary will be worth 10 points and instructions and requirements for the written summaries are given on a separate page. Summaries will be included as a portion of the lecture grade.**

4. **The lecture grade will be determined in the following manner.**

1st lecture exam	100 **pts.**	**Scale**
2nd lecture exam	100 pts.	A = **90%**
3rd lecture exam	100 pts.	B = **80%**
5 summaries @ 10 pts.	50 pts.	C = **70%**
Two Hour Comprehensive Final Exam	**150** pts.	D = **50%**
		below 50%
	500 pts.	=F

5. **Lecture exams will include 10 extra credit points each, while the final exam will not include extra credit points. The final examination is a two hour comprehensive exam with 50% of the exam including questions repeated from the previous 3 lecture exams.**

6. **Any exam that the student fails to complete** at the **expected time can be made up only with a physician's excuse or valid reason to be determined by the** instructor.

POLICIES, CLASS STANDING, OFFICE HOURS, **AND EXTRA HELP**:

1. Attendance is **mandatory** for each lecture and laboratory. **Attendance will be monitored as required for federal guidelines. Attendance for laboratory is especially important and unexcused absences for both lecture and laboratory will result in grade penalties to be determined by the instructor.**

2. **Quizes missed can not be made up, but excused absences will result in excused quizes.**

3. **Incompletes and early exams are not given. Extra credit work is not normally permitted.**

4. **Students may obtain their grades any time by consulting the instructor. Those with deficient grades will be notified prior to the withdrawl deadline of April 5, 1999. Students receiving deficiencies must consult with the instructor.**

5. **Peer tutoring is available. Please consult the instructor for tutoring from the Learning Center or upperdivision biology students.**

POLICIES, CLASS STANDING, OFFICE HOURS AND EXTRA HELP CONT'D..

6. **The instructor's office is in Henry Hall,** Rm 16, phone 735-4808, fax (808) 739-4618, e-mail= **RIwamoto@Chaminade.** edu. **The department secretaries phone** is 735-4837. **Office hours are posted on the door of the office.** If **you can not see me at office hours, please make an appointment or see me** after **lecture.**

7. **Please note that it is biology department policy to reduce grades by one grade level for late assignments within 24 hours of the deadline and a F grade is recorded for assignments later than 24 hours. This is for summaries, lab reports, and other assignments.**

8. **Those students with special needs, e.g., learning disabilities, should consult with the instructor during the first or second week of classes.**

9. **Academic dishonesty including cheating, plaigarism, and other serious offenses, such as giving answers to another student will not be tolerated. Appropriate action will be taken.**

Bio. 203/204-Cellular & organismic Biology Mr. R. Iwamoto
Chaminade University of Honolulu

CELLULAR & ORGANISMIC BIOLOGY SUMMARIES

Cellular & Organismic Biology Summaries

1. The objectives of the summaries are threefold:
   a. To read and report on current topics in biology;
   b. To offer an alternative to quizes and examinations; and
   c. To participate in "writing across the curriculum," compositions in each area of the university curricula. This should help you develop the ability to research and write about selected topics.

2. There will be five, one to two paged summaries. Each summary will be worth 10 points and the total will be 50 points that are counted in the lecture_ ade.

3. The summaries must be from a 1999 publication of a newspaper, magazine, journal, or internet/web pages which must be pertinent to the biology field, e.g., not geology or chemistry.

4. Summaries are to be word processed or typed following university writing standards. The summary must include: author, title of article; title of journal, magazine, or newspaper with titles of sources, e.g., newspapers italicized or underlined; date of publication; page number(s). Please use the following for web site publications:
   Author (if known). "Title" (main title if appicable). Last date updated or revised (if known. <URL> (date accessed).

5. Please submit a xerox copy or internet/web page print out of the article with your summary. If you utilize National Geographic, Time, or Hawaii Fishing News articles, you need not xerox the article as the instructor has subscriptions to the above.

6. Due dates for summaries are listed on the course outline. Please submit summaries on time as there are penalties for lateness, reduction in one grade level for submission within 24 hours of the deadline and F for those after 24 hours of the deadline.

7. Examples of summaries are available for examination during the first weeks of classes.

CHAMINADE UNIVERSITY OF HONOLULU *SESSION: SPRING 1999*
Honolulu, Hawaii 96816 *On Campus*
COURSE OUTLINE-SUBJECT TO CHANGE

BIO 20402 (3 Crs) Cellular & Organismic Biology Mr. R. Iwamoto
Dept. No. #Crs. Title Instructor

WEEK	DATE		ASSIGNMENTS	
	JAN 11	M	Introduction:Syllabus & Course Outline	Chapt. 10 pp. 203-214
1	13	W	Gene Structure & Function	
	15	F	Gene Transcription & Translation	Chapt. 11 pp. 215-232
	JAN 18	M	FATHER CHAMINADE/MARTIN LUTHER KING DAY, NO CLASSES	
	19	T	LAST DAY TO ADD/DROP CLASSES	
2	20	W	Gene Control	Chapt. 13 pp.257-276 QUIZ
	22	F	Inheritance	Chapt. 14 pp.277-306
	JAN 25	*M*	Genes Gone Wild: Cancer	SUMMARY ONE DUE
3	27	W	Recombinant DNA technology	
	29	**F**	**FIRST LECTURE EXAM, CHAPTS. 10-14**	
	FEB 1	M	Phylogeny and Classification	Chapt. 32 pp.726-734
4	3	W	Diversity of Plants and Animals	Chapts. 36-43, Handouts
	5	F	Plant Nutrition	Chapt. 16 pp.323-342
	FEB 8	M	Animal Nutrition Video	
5	10	W	Animal Nutrition/Digestion	Chapt. 17 pp.343-372
	12	F	Digestion	SUMMARY 2 DUE

	FEB 15 M	PRESIDENT'S DAY, NO CLASSES		
6	17 W	Digestion		
	19 F	Respiration		Chapt. 18 pp.373-388 QUIZ
	FEB 22 M	Respiration		
7	24 W	Plant Transport		Chapt. 19 pp.389-406
	26 F	SECOND LECTURE EXAM, CHAPTS. 32, DIVERSITY HANDOUTS, 17, & 18		
	MAR 1 M	Circulation		Chapt. 20 pp.407-432
8	3 W	Circulation		
	5 F	Circulation	SUMMARY 3 DUE	
	MAR 8 M	Immune System		Chapt. 21 pp.432-452
9	10 W	Excretion		Chapt. 22 pp.453-474
	12 F	Excretion	**QUIZ**	
	MAR 15 M	Excretion		Chapt. 23 pp.475-488
10	17 W	Plant Hormones	**SUMMARY** 4 DUE	
	19 F	Plant Reproduction		Chapt. 24 pp.489-506
11	MAR 22-26 M-F SPRING RECESS, NO CLASSES			
	MAR 29 M	Animal Hormones		Chapt. 25 pp. 507-530
12	31 W	THIRD LECTURE EXAM, CHAPTS. 19-22		
	APR 2 F	GOOD FRIDAY, NO CLASSES		

	APR	5	M	Animal Hormones LAST DAY TO WITHDRAW WITHOUT GRADE PENALTY	
		6	T	BEGIN PRE-REGISTRATION FOR FALL **1999**	
13		7	W	Reproduction	Chapt. 26 pp. 531-556
		9	F	Reproduction and Development	Chapt. 27 pp. 557-586
	APR	12	M	Nervous System	Chapt. 28 pp. 587-616 **SUMMARY** 5 DUE
14		14	W	Nervous System	Chapt. 29 pp. 617-648
		16	F	Nervous System	
	APR	19	M	Skeletal-Muscular System	Chapt. 30 pp. 649-669
15		21	W	Skeletal-Muscular System	QUIZ
		23	F	Evolution	Chapt. 31 & 32 pp. 669-736
	APR	26	M	Evolution LAB EXAM WEEK	
16		28	W	Ecology	Chapt. 34 pp. 763-802
		30	F	Ecology	

17 MAY 3, 1999, **MONDAY,** 10:30 AM-12:30 PM, TWO-HOUR COMPREHENSIVE FINAL EXAMINATION

IMPORTANT DATES: *JAN 19 LAST DAY TO REGISTER, ADD/DROP CLASSES*

APRIL 5 LAST DAY TO WITHDRAW FROM CLASSES

MAY 3-6 FINAL EXAM WEEK

Bio. 204L-Cellular & organismic Biology Laboratory **Spring 1999**
T 2-4:50 or Th 2-4:50, one semester credit **January 11,**
Chaminade University of Honolulu **1999 to**
Instructor: Ronald M. Iwamoto **May 6, 1999**

COURSE OUTLINE AND SYLLABUS

TEXT:

Keeton, William T., Michael W. Dabney, and Mary Philpott 1986 Biological Investigations in the Laboratory. W.W. Norton & Company, N.Y., N.Y.

COURSE DESCRIPTION: **The course description is from the 1998-1999** *General Catalog.*

> **One three-hour laboratory period per week to accompany BI 203 and BI 204. Laboratory work such as thin layer chromatography and enzyme kinetics experiments. Offered annually.**

LABORATORY AIMS/GOALS: **The laboratory is designed to fulfill the following goals.**

To present principal methods or techniques using appropriate instruments utilized in the study of cells and organisms.

2. **To allow investigation and problem solving by manipulative and experimental methodology including preparation and completion of laboratory reports.**

3. **To examine applications of principles and concepts presented in lecture, such as the relationship between oxygen consumption and size in respiration.**

4. **To observe and identify plants and animals, living and preserved, of both Hawaiian and introduced species.**

5. **To learn structure and function of cells, tissues, organs, and systems by microscopy, preserved and live specimens, experimentation, and dissection.**

OBJECTIVES FOR STUDENTS: **At the completion of the course, the student will be able to do the following.**

Explain techniques of a particular experiment and use instruments, such as a microscope, balance, spectrophotometer, pH meter, and Winkler bottles.

2. **Explain applications of biological principles discussed in situ field trips and in the laboratory, such as adaptations of coastal plants or amniocentesis.**

OBJECTIVES FOR STUDENTS CONT'D...

3. Identify and discuss plants and animals, microscopic and macroscopic structure/function.

4. Design, complete, interpret, and report experimental data from an experiment in a written scientific report in a format suitable for presentation and submission to a biological journal.

LABORATORY PREPARATION OUTLINE AND ATTENDANCE:

1. Preparation of laboratory assignments listed on the lab outline and presented in lab hand-outs are essential in successful completion of the laboratory.

2. Hand-outs in the laboratory outline refer to assignments not in the lab manual. Lab hand-outs will be given to students prior to the laboratory exercise and include procedures and instructions for the laboratory.

3. Attendance for the laboratory is mandatory. Laboratory absences must be documented by valid excuses, such as a physician's excuse. Grade penalties will be imposed for unexcused absences by the instructor.

GRADE DETERMINATION:

A separate grade is given for laboratory.

Laboratory grades will be determined in the following manner with the same scale used for lecture.

Laboratory Exam 1	100 pts.
Laboratory Exam 2	100 pts.
Laboratory Notebook (graded twice)	50 pts.
Two Laboratory Reports Q 25 pts.	50 pts.
Quizes and unknowns	50 pts.
	350 pts.

3. Laboratory exams are station exams with students moving from station to station answering questions at each station in a specified time period. Each laboratory exam contains 10 extra credit points. The second lab exam is not comprehensive and includes material covered since the first lab exam.

4. Laboratory quizes will be announced and unannounced with the same policies for lecture except that quizes will <u>not</u> be used to replace low exam scores.

LABORATORY NOTEBOOK:

1. Each student will be required to maintain a bound laboratory notebook into which all laboratory information and data is to be directly entered. Lab notebooks will be periodically checked and graded. Lab notebooks will be submitted at the time of laboratory exams.

2. The notebook should be bound with non-tear out pages. Spiral bound notebooks are unacceptable.

3. The format and grading of lab notebooks are given on a separate hand-out. Please follow the format including a table of contents with topic, date, and page numbers.

LABORATORY REPORTS:

1. The format and components of a laboratory report are included in a separate hand-out. Sample reports will be available for examination.

2. Both lab notebooks and lab reports that are late will be penalized by one grade level. Lab notebooks and lab reports later than 24 hours will receive F grades.

POLICIES,. CLASS STANDING- OFFICE HOURS, AND EXTRA HELP:

1. Please consult the lecture syllabus as the same policies, will be followed.

Bio. 203-204L-Cellular & Organismic Biology

Mr. R. Iwamoto

LABORATORY NOTEBOOK

Previous experiences have demonstrated that compilation of observations, data collection, calculations, and reporting of results is a problem for many scientists and students. To avoid repetition of previous difficulties, i.e., lost, uninterpretable, unrecorded ("he took it I didn't"), or dissolved by water or chemicals data, purchase a bound (non-spiral, non-tear out page) type of laboratory notebook. The following procedures are to be followed in your notebook.

1. All observations, data, calculations, laboratory notes, and lab related materials must be entered directly into the notebook. Neatness is not a prerequisite, but it is a necessity that notes be legible to you.

2. An index or table of contents is required and includes the following: a) date of exercise, b) topic, and c) page numbers in the lab book.

3. Number the pages in your notebook if unnumbered. Uneven numbered pages are used for field data or original observations, rough calculations, and unorganized materials. Even numbered pages are used for organized summaries, answers to questions, and conclusions.

4. Drawings are mandatory with. identification of structures and organism. Specific characteristics differentiating the specimen from others should be noted for later use, i.e., studying for identification questions on exams.

5. Since recopying of notes is discouraged, notebooks should be presentable with information completed to the current lab period. Notebooks will be examined without previous notice to determine progress.

6. Grading of notebooks is based on 1) organization-inclusion of all assigned works, table of contents, labeling and identification of structures and specimens in drawings, and completeness of data collected and 2) interpretations-observations in exercises, completeness/correct answers to questions asked, conclusions drawn, and error analysis.

Hints;

1. Record everything and anything in the beginning. With time and experience you will learn what, how, and why to record information with your own shorthand that will allow greater freedom in recording and interpreting.

2. Immediately after obtaining data and completing observations, review and organize them. Remember that time is the ally of forgetfulness.

3. Use writing material that is waterproof and streak proof.

4. Do not depend on "the other person" to take your notes, especially when working in group type experiments and exercises or field trips.

5. Lab hand-outs, review articles, supplemental information, and completed lab reports can be afixed to your notebook. References used should definitely be included with name(s) of author(s), title, year, and volume/page numbers.

6. When the instructor presents information, especially at the beginning of the lab period, write copious notes. Often lab exam questions and significant information for successful completion of lab exercises are contained in the beginning briefing.

FORMAT AND PROCEDURES FOR LABORATORY REPORTS

FORMAT:

1. **Title:** A title explains to the reader what the report contains. A title *should not* be so general that it does not specify what the experiment is, i.e., "osmosis." Neither should the title be so long that it tells everything, i.e., "Osmosis using *dialysis* bags containing 1.5M sucrose placed in isotonic, hypertonic, and hypotonic solutions with iodine added to determine porosity of the membrane." Be creative and imaginative to attract the interest of the reader. Do not use the title on the laboratory hand-out or from the laboratory text.

2. **Abstract:** An abstract is a brief, one-paragraph summary of the results of the experiment. Some investigators include short sentences on the purposes or objectives of the experiment. It precedes the introduction with single spacing, and is indented. Identify your abstract by placing the word, abstract, bef ore the paragraph.

3. **Introduction:** This portion includes a *full discussion of* the objectives of the experiment. It also includes the biological concepts or principles on which the experiment is based and what is expected in the experiment. Some writers include a brief review of evidence from previous experiments or known information derived from previous testing.

4. **Methods and Materials:** Methods, techniques, equipment/supplies used are included in this portion. You may be brief by stating: "Please refer to the methods and materials as given in the lab hand-out or lab manual." You must include 1) a description of the control and why such a control was utilized and 2) explanations of deviations from the expected procedures

5. **Experimental Data:** Consolidate your data into tables and graphs. Use the following format: 1) Table 1. "Title cf Table." and 2) Fig. 1. "Title of Figure (graph). Units must be included. Calculations may be included in this section which precedes the discussion section.

6. **Discussion:** This portion discusses and explains the results of the research. It includes a comparison of the results to the theoretical principles and what was expected. Error analysis or plausible reasons for deviations must be included. *Concentrate* on errors *of* experimental design and instrumentation and do not rely solely on technique errors, i.e., "the investigator titrated the wrong volume or did not obtain the correct weight." Answers to questions asked by the experiment are included in this section, i.e., questions asked on hand-out sheets.

7. **Conclusions:** An optional portion in which the investigator asseses the experiment by listing in short sentences the results.

8. **Literature Cited or Used:** A part of the report comparable to a bibliography that cites works of others used in the report. You must cite works of others even if direct quotes were not used or you are guilty of plagarism. If direct quotes are used, follow standard English procedures. Be consister with references, e.g. author's last name first, initials, year, title in quotes if journal or underlined if text, volume, page numbers, and publisher if text.

Bio. 203-204L:Cellular & Organismic Biology Lab

FORMAT AND PROCEDURES FOR LABORATORY REPORTS CONT'D...

1. Laboratory reports are separate papers that are not written into the laboratory notebook.

2. Word processed or typed reports are mandatory.

3. Reports are due on dates listed in the laboratory outline and those laboratories requiring reports are so indicated in the laboratory outline.

4. Two references, other than the laboratory manual, hand-out, or text, are required and are usually used in the introduction section.

5. It is expected that correct English grammar, spelling, and syntax be used in reports. Points will be deducted for incorrect usage of English.

6. Length of papers is not to exceed 6 pages double spaced with the exception of the abstract and does not include a reference and title page.

7. On occasions that require that data from the entire laboratory section be pooled or used, it is the student's responsibility to obtain the results. Obtain the results during the laboratory period and do not wait till the following day or next laboratory.

8. Written policies in the syllabus on lateness will be followed. Late papers within 24 hours will be reduced one grade level and papers later than 24 hours will receive F grades.

CHAMINADE UNIVERSITY OF HONOLULU *SESSION: SPRING 1999*
Honolulu, Hawaii 96816 *On Campus*

LABORATORY OUTLINE-SUBJECT TO CHANGE

Dept.	No.	(# C S)	Title	Instructor
BIO	204L01 & BIO 204L02	(1 CR)	CELLULAR & ORGANISMIC BIOLOGY LABORATORY	MR. R. IWAMOTO

WEEK	DATE		ASSIGNMENTS
1	JAN 12	T	Introduction: Syllabus, Lab Outline, Procedures for the Lab; and
	14	Th	Microscopy, Topic 1 pp. 1-14
2	JAN 19	T	Classification & Dichotomous Keys, Appendix 2 pp. 309-317, Skim pp. 310-317, Handouts on Algae, Fish, and Invertebrate Classification;
	21	Th	Diversity of Plants & Animals-Handouts, Skim Topics 23-29; and **HOMEWORK** ON FISH KEY
3	JAN 26	T	Kaloko Cove Estuary Field Trip: Estuarine Tidepool Ecology, Adapatations of Endemic Coastal Plants-Handouts, Measurements of pH (pH meter), temperature, and salinity (refractometer); and One Page Position Paper Due on Feb 9 & 11 on Development of East Oahu Coastline
	FEB 2	T	Soil Tests for pH and Plant Nutrients-Handouts, Demonstration of the Bomb Calorimeter-Handouts; and
4		Th	Nutrition Computer Program-An Analysis of Each Student's Dietary Intake:RDA, fats, proteins, carbohydrates, vitamins and minerals QUIZ ON **KALOKO** COVE

	FEB 9	T	Digestive System: Dissection of Fetal Pig, Topic 5 pp. 39-50; and
5			
	11	Th	Digestive Structures: Dissection of Lumbricus (earthworm), demonstrations of molluscan radula, echinoderm Aristotle's Lantern, baleen from whales, and Squalus (dogfish shark) spiral valve-Handouts
	FEB 16	T	Oxygen Consumption Experiment: Winkler Oxygen Titration Method of Fish and Crayfish-Handouts LAB REPORT DRAFT DUE 2/23 AND 2/25;
6			
	18	Th	Respiratory System: Dissection Fetal Pig, Topic 6 pp. 51-61; and
			Demonstrations of Respiratory Structures: gills, trachea, spiracles, and stoma
	FEB 23	T	Waikiki Aquarium and/or Honolulu Zoo-Handouts
7			
	25	Th	OXYGEN CONSUMPTION DRAFT DUE
			QUIZ ON OXYGEN CONSUMPTION EXPERIMENT
	MAR 2	T	Plant Respiration and Circulation Topic 7 pp. 62-77; and
8			
	4	Th	Circulatory System: Dissection Fetal Pig, Blood Cells, Blood Pressure Measurement (Sphygmomanometer), Chemical Effects on Hearts, Topics 8 & 9 pp. 78-94
	MAR 9	T	
9	11	TH	FIRST LAB EXAM AND LAB BOOR DUE
	MAR 16	T	Volume Regulation Experiment with Sea Hares and Crabs-Handout, LAB REPORT DUE 4/6 & 4/8;
10			
	18	TH	Excretory and Reproductive Systems: Dissection of Fetal Pig, Topic 10 pp. 95-101; and
			Demonstrations of flame cells of Planaria and Dissection of Malpighian tubules of grasshopper
			OXYGEN CONSUMPTION REPORT DUE 3/16 & 3/18
11	MAR 22-26		SPRING RECESS, NO CLASSES

12	MAR 30	T	Plant Reproduction: Cone, Flowers, Fruits, & Seeds, Topic 24 pp. 254-261 and Handouts,
	APR 1	Th	Contraceptive Devices: IUD, Sponge, Condom & Other Types; and Sea Urchin Fertilization & Embryology, Topic 21 pp. 206-222 QUIZ ON EXCRETORY SYSTEM
13	APR 6	T	Nervous System: Dissection of Sheep Brain, Topic 12 pp. 109-118, Model of Brain, Ear, & Eye; and
	8	Th	Skeletal-Muscular System, Topic 13 pp. 119 136, Biochemical Tests on Rabbit Muscle VOLUME REGULATION REPORT DUE
14	APR 13	T	Aiea or Waiahole Forest Hike: Tropical Forest and Freshwater Habitats-Handouts
	15	Th	
	APR 20	T	Behavior: Plant & Animal, Topic 14 pp. 137-145; and
15	22	Th	Dissection of Crab, Clam, & Starfish-Handouts
16	APR 27	T	SECOND LAB EXAM, LAB BOOR DUE
	29	Th	

IMPORTANT DATES: *JAN 19 LAST DAY TO REGISTER, ADD/DROP CLASSES*

APRIL 5 LAST DAY TO WITHDRAW FROM CLASSES

MAY 3-6 FINAL EXAM WEEK