

**BIO 206L**  
**UNIQUES: 49080-49240**  
**Laboratory Experiments in Biology:**  
**Structure and Function of Organisms**

**Course Syllabus: SPRING 2009**

**Instructors: Drs. A. W. Allen, A. Lloyd, and W. Thompson**  
**Laboratory Supervisor: Dr. D. Brownson**

<b>LAB #</b>	<b>LECTURE DATE</b>	<b>Lab Topic</b>
01	JAN. 26	Introduction to the Laboratory
02	FEB. 02	Techniques of Microscopy I Bright field Phase contrast
03	FEB. 09	Techniques of Microscopy II Fluorescence
04	FEB. 16	Representative invertebrates: Anatomy of the Crayfish ( <i>Procambarus simulans</i> ), ghost shrimp, ( <i>Palaemonetes sp.</i> ) and amphipoda  <i>Paramecium</i> Digestion
05*	FEB. 23	Physiology of the Crayfish, ( <i>Procambarus sp.</i> ) Human Cardiovascular Physiology
06	MAR. 02	Urchin ( <i>Arbacia punctulata</i> ) & Chick ( <i>Gallus domesticus</i> ) reproduction and development  Fungal Reproduction Lab ( <i>Phycomyces blakesleeanus</i> )
07*	MAR. 09	Bacterial Transformation ( <i>Escherichia coli</i> )  Development lab ( <i>Arabidopsis thaliana</i> )
	MAR. 16-21	<b>SPRING BREAK</b>
08	MAR 23	Representative vertebrate: Anatomy of the Rat ( <i>Rattus norvegicus</i> )
09*	MAR. 30	Dominance Behavior of the Common Cricket ( <i>Gryllus domesticus</i> )
10*	APR. 06	Nest Recognition in the Harvester Ant ( <i>Pogonomyrmex barbatus</i> )
11*	APR. 13	Plant Transpiration from the bean leaf ( <i>Phaseolus vulgaris</i> )
12	APR. 20	Introduction to Neurophysiology Labs
13	APR. 27	Frog Sciatic Nerve
14	MAY. 04	Frog Nerve/muscle
	MAY 15 & 19	<b>FINAL EXAMS</b>

\*These labs are choices for preparation of formal lab reports.

# LABORATORY EXPERIMENTS IN BIOLOGY: STRUCTURE AND FUNCTION OF ORGANISMS

## Introduction

Bio 206 deals with the structure and function of organisms. Obviously this covers a vast amount of information. It is impossible to treat this much material in depth in a single semester course. Therefore, we shall emphasize certain things that we consider to illustrate important biological principles. You will be exposed to a diversity of biological material, mainly in an experimental rather than a descriptive context. You should have either registered for or have credit for BIO 311D or BIO 214 in order to take BIO 206L. If this is not the case you should consult one of the instructors as soon as possible.

During this course you will conduct exercises that illustrate some of the relationships between structure and function in organisms. You will write lab reports explaining your observations as well as their significance.

You are required to attend lecture meetings associated with this course. They provide an important introduction/background for the lab exercises.

You should **read each exercise before coming to lab**. You should check the **class website** (<http://www.bio.utexas.edu/courses/bio206/>) often for special announcements concerning exams, review sessions, changes in deadlines, etc.

**Do not begin any lab work** until instructed to do so by your Laboratory Instructor; in some cases there will be additional instructions, altered procedures, or special precautions that must be explained first.

**Always label materials** that you are working with. In most cases you will use a short piece of white label tape (4-5 cm long) to make a label. A complete label has the following information: Name (or initials), Date, Exact contents, Experiment designation, & lab number.

## Textbooks

The required texts for Bio 206 are the lab manual: ***Laboratory Experiments in Biology: Structure and Function of Organisms*** printed by the University CO-OP and the ***Photo Atlas for Biology, 1st ed. (1996) by Perry and Morton***. An optional text, ***Biology: Concepts and Applications 7<sup>th</sup> ed. (2008) by Cecie Starr*** is recommended for students who do not have a biology text to use as a background reference. All text page references in the manual refer to either the Perry and Morton or Cecie Starr texts.

Supplemental reference material will be on reserve in the **Life Sciences Library** (MAI 220). Included in this material will be sample articles, books, and a guide to provide you with information to help you write your major lab reports.

## Online Facilities-Class Website

Copies of handouts, class announcements, and additional material and photographs from class can be found on the class web page. Passwords will be made available to students for protected sections on the website:

<http://www.bio.utexas.edu/courses/bio206/>

Copies of the lecture slides can be found at the following address:

<http://www.bio.utexas.edu/courses/Bio206/powerpoints/>

## Additional Requirements

Monday lecture is a required component of the lab. You must attend the lecture and the lab for which you are registered unless you are given permission from an instructor to do otherwise. We are **not** able to offer make-up labs. It **may** be possible for you to conduct a lab exercise at a time other than your regularly scheduled lab period. If you are going to miss a lab or you do miss your laboratory with a valid excuse, please fill out the online **Change Lab Request Form** in a timely fashion. Dr. Delia Brownson will attempt to assign you another lab session for that week.

By the second lecture on February 2, all students need to purchase an individual RF response pad from the bookstore (UT CO-OP). Along with the pad itself, you will purchase an enrollment code. Students are responsible for registering their response pad online under the unique number for the lecture and lab, which they have registered. Be sure to use your **UTEID** as your identification number! Students are required to bring their response pad to every lecture and lab since your participation and quiz grades will depend upon your individual responses on the wireless cps system used in the lectures and laboratories.

For more information on the wireless cps system is available on line at the following address: <<http://www.ph.utexas.edu/~ctalk/>>

### ***eGradebook***

All student grades will be available for individual inspection on *eGradebook*. Access your class grades on *eGradebook* via **UT Direct**. You need your **UT EID** in order to access your *UT Direct* site. Once you are on *UT Direct*, you should find the unique number for the BIO 206L section for which you registered. This will be your link to your grades. You are expected to follow your grades on *eGradebook* and immediately report any discrepancies to your lab instructor for rectification.

### **Grading**

Your grade will be determined by *eGradebook* using the assigned percentages of your performance on the following:

Informal Lab Write-ups	(best 12 of 13) @ 10 pts. each	120 pts	29.13%
Formal Lab Reports	(written for 1 lab) @ 30 pts.	30 pts	07.28%
Midterm Exam	(Lecture and laboratory) @ 90 pts.	90 pts	21.84%
Final Exam	Lecture and laboratory) @ 90 pts.	90 pts	21.84%
Lab Quizzes via cps	(best 12 of 13) @ 5 pts. each	60 pts	14.56%
Lecture participation via cps	(Best 11 of 13) @ 2 pts. each	22 pts	05.34%
<b>TOTAL:</b>		<b>412 pts</b>	<b>100.00%</b>

### ***Formal Lab Reports***

You will write the results of one of the laboratory exercises conducted during the semester as a formal lab report. This report is to be submitted in the format of an article in a professional scientific journal. See the separate "Guidelines For Lab Reports" in your lab manual.

### ***Informal Lab Write-ups***

All of the remaining 13 labs are to be recorded in the student's informal lab write-ups. The entries for experiments should include a brief description of the materials used (including identification of the organism[s]), a one-paragraph summary of the procedures followed, the results obtained, and a summary or conclusion as appropriate for the exercise. The results may be data in tabular or graphic form or description or illustrations of observations, depending on the type of exercise. ***You must have participated in the lab in order to turn in a lab write-up!***

The observations of living or preserved specimens should be in the form of notes, drawings, and/or diagrams as appropriate for the exercise and must include complete identification of the organism, body part(s) or structure(s), and any other pertinent information (e.g., age or state of maturity, sex, specific strain or preparation, etc.). Any illustration made with the aid of a microscope should have a note next to it indicating the type of microscope used (e.g., bright-field) and the total magnification at which the specimen was observed. The Laboratory

Instructors will provide students with a guideline at the beginning of each lab for the number and types of drawings that are expected for the particular lab. If the exercise involves making a series of observations to note changes over time, the report should also include a brief summary or conclusion. The work will not be graded on the quality of the artwork; however, the organisms and/or structures must be clearly recognizable and properly labeled.

**The reports must be the student's own work; tracings of drawings in the manual or another student's report or plagiarism of another student's results or summary/conclusions will not be tolerated.** Each individual exercise must be identified; multiple exercises in a single lab must be clearly separated from each other, preferably, in numerical order. Students may make their observations and/or notes on a piece of paper and then copy them into the lab reports. Grading of the work will be based on completeness, evidence that experiments have been conducted correctly and carefully, accuracy of illustrations and identifications/labels, interpretation of results, and clarity. Neatness will also be a consideration. Laboratory exercises completed in this format will be due one week following the lab in which the experiment was performed, unless your Laboratory Instructor informs you otherwise. Any Exercise that is turned in late will be penalized by a reduction of 5% from the total possible points for each day that it is late and will receive a grade of "0" if turned in more than one week late. The exercises should be submitted to your Laboratory Instructor. Each entry for each laboratory will be worth 10 points. The lowest grade of the 13 labs will be dropped in the computation of your final grade.

### *Midterm Exam*

There will be a midterm exam given on Monday March 30 from 7:30 PM to 9:00 PM. This exam will cover both lecture and laboratory material relating to Labs #1 through #7; it will have a written as well as a practical portion. The details of this exam will be discussed at a later date.

### *Final Exam*

This exam will cover both lecture and laboratory material relating to Labs #8 through 14; it will have a written as well as a practical portion. The *tentative* Final exam for the class follows the official university posted exam schedule: <http://www.utexas.edu/student/registrar/schedules/092/finals/>. The university will post the definitive final exam schedule three weeks prior to the exams.

Lecture meeting time	Date of final	Time of final
Monday 8:00-9:00 AM	Tuesday 19 May	2:00 PM-5:00 PM
Monday 9:00-10:00 PM	Tuesday 19 May	9:00 AM-12:00 PM
Monday 2:00-3:00 PM	Friday 15 May	9:00 AM-12:00 PM

### *Quizzes*

Your Lab Instructor will give quizzes at the beginning of each lab to make certain you are preparing for lab properly. The quiz questions will come from a bank of possible quiz questions posted on the class website. These will be brief quizzes that will cover the information presented in lectures and/or information in the lab manual that you should know in order to conduct the lab scheduled for the week of the quiz. If you read the exercise before coming to class and attend the lectures, these quizzes should be quite easy. The quizzes will count a total of 60 points.

### *Final Course Grade*

One informal lab report grade and one quiz grade are dropped. Two lecture participation (CPS) grades are dropped. *eGradebook* then calculates scores based upon percentages allotted to each section (e.g., 21.84% for the final exam) out of the actual number of available points. Letter grades will be awarded as follows: 100 to 90 = A; 89 to 80 = B; 79 to 70 = C; 69 to 60 = D; 59 to 0 = F.

***Each student will be evaluated individually based on the number of total points achieved by the student. The grade you earn is the grade you will receive!***

### \*\*\* IMPORTANT NOTES \*\*\*

There **will not be any extra credit** assignments to make up for poor performances on quizzes or exams.

Students are responsible for keeping track of the important dates listed in the University calendar that may affect their status.

January 23 Friday	Last day of the official add/drop period, after this date, changes in registration require the approval of the chairman and usually the student's dean. (See <i>General Information</i> , chapter 4, for required approvals.)
February 4 Wednesday	Last day to drop a course for a possible refund.
February 16 Monday	Last day to drop a course without a possible academic penalty. (See <i>General Information</i> , chapter 4, for required approvals.)

The information in the boxes above is quoted from the "Calendar of the University," *The University of Texas at Austin: Course Schedule Spring 2009*

### **Students with Disabilities**

Please notify your instructors *at the beginning of the semester* of any modification/adaptation you may require to accommodate a disability-related-need. You will be requested to provide documentation to the Dean of Students' Office, in order that the most appropriate accommodations can be determined. Specialized services are available on campus through Services for Students with Disabilities.

### **Policy on Scholastic Dishonesty**

Students who violate University rules on scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and/or dismissal from the University. Since such dishonesty harms the individual, all students, and the integrity of the University, policies on scholastic dishonesty will be strictly enforced. For further information please visit the Student Judicial Services Website: <http://deanofstudents.utexas.edu/sjs>.

## GUIDELINES FOR FORMAL LAB REPORTS

### Course Requirements

Each student is responsible for preparing and submitting one formal lab report. Your Laboratory Instructor may assign the whole class to write a formal report on one specific laboratory exercise. Otherwise, you may choose the lab on which you will prepare reports from any of the laboratory exercises designated with an asterisk on the syllabus. The report will be due one week following the lab in which the experiment was completed unless your Laboratory Instructor informs you otherwise. Reports that are turned in late will be penalized by a reduction of 5% from the total possible points for each day late and will receive a grade of "0" if turned in more than one week late. The reports should be submitted to your Laboratory Instructor. The formal lab report will be worth 30 points (grade out of 100 X 0.30).

The major lab report is to be written in the format of an article in a professional scientific journal. Samples of journal articles may be reviewed among the publications shelved in the Life Science Library. The report must be the student's own work; tracings or drawings in the manual or another student's notebook or plagiarism of another student's work will not be accepted. The report should be submitted to your Laboratory Instructor.

### Writing Guidelines

The reports should be typed on 8.5 X 11 inch white paper. Use consistent margins (1" top & bottom margins; 1.25" left & right margins). Each report may not be longer than 10 pages, including a title page and a list of references cited. All information included in a report must be typed. Text must be written in complete sentences, using correct grammar, syntax, and spelling. Since you are reporting on an activity performed in the past, use the past tense where it is appropriate. In addition, avoid personal pronouns and speak as a detached reporter. Sentences and paragraphs should flow in a logical sequence so that the reader can easily understand the contents. Include tables, figures, and other illustrations whenever you think they are suitable. The report should be double-spaced, except for the abstract and list of references, which should both be single-spaced. Except for the title page, all pages should be numbered. Please do **not** put the reports in covers.

### Formal Lab Report Grading

A grade will be assigned to your formal report, based on the following criteria:

Title & Abstract	10%
Introduction	10%
Materials & Methods	10%
Results, including figures, illustrations, etc.	25%
Discussion	20%
References	10%
Style, grammar, spelling, etc.	10%
Legibility, neatness, labeling, etc.	05%



## Components of the Reports

Page one of your report should contain only the following information, arranged on the page as shown below:

**Title**

**Your Name**

**BIO 206, Semester, Year**

**Date the report is due**

**Title:** The title succinctly describes the whole report in 12 words or less. Avoid cute titles. Choose an informative title for the report that you think best describes what you investigated in the exercise. Do not use the title of the laboratory exercise that is given in your laboratory manual. The title should include the independent and dependent variables involved in the investigation. Include the scientific name of the organism in the title.

The body of the report (the substantive information of the report) should follow the title and begin on page two. The body should be written in sections and each section should begin with a heading. The following sections, with their appropriate headings, must all be included and presented in the order listed below.

**Abstract:** (Single spaced) Begin page two of your report with the title (the same title used on page one). Write the abstract below the title on page two. Don't put any other information on that page of the report. The abstract should be no longer than half a page. It should be an attempt to capture the essence of the entire report. Thus, it should clearly describe your results, but it should also include elements of the introduction, materials and methods, results, and conclusions as they can best be summarized. Do **not** cite references in the abstract. Write the abstract single-spaced in paragraph form, without including any tables, figures, or other illustrative information. Even though the abstract is the first component of the body of the completed report, you may find it easiest to prepare the abstract last.

**Introduction:** (Double spaced) Begin page three of your report with the introduction. The introduction provides background information that helps prepare the reader to understand the remaining contents of the report. For example, it may describe the theory or purpose of techniques used in the exercise, it may describe the general significance of some of the methods, and/or it may refer to literature which the reader may wish to consult in order to learn more about related work. Finally, it should also include the objectives of your work. The introduction of most reports will be less than one page long. This is where most references are cited in scientific publications. This section is not supposed to be a page of direct quotations. Cite references in the text by placing the name of the author(s) and date (APA style) in parentheses at the end of the sentence citing the information. \* If there are more than two authors, write the first author's name and then "*et al.*" The list of references with all the authors is included as the last section of the report.

*\*The investigator was most interested in the mice that eluded capture (Crowcroft, 1966, p. 66).*

**Methods and Materials:** (Double spaced) This section describes the procedures, methods, techniques, organisms or cultures, instruments used to conduct the work, and any data analysis methods used to obtain the results described in the paper. The methods section should **not** include any data, but only a description of the biological material studied and the means employed to collect data and obtain results. Be selective in what you include in this section, describing only methods and materials that help the reader to generally understand what was done. The purpose is to outline what one would do to reproduce your experiment. The entire procedures section from your laboratory manual should **not** be included in your report. Assume the reader has the same level of experience as you do.

**Results:** (Double spaced) This section will likely be the longest part of your report, as it is the central section of most reports. The results section should include the actual data you gathered in the laboratory, displayed in a concise, logical format. Figures, tables, and other illustrations are all appropriate for the results section. Embed figures and tables within the text. Introductory text should precede figures and tables. The results must contain well-organized and well-written text, in paragraph form, which explains the graphic data. The information in this section should flow naturally from one topic to the next, so that the reader's interest is sustained. Be careful that this section contains only results you observed and **not** conclusions or explanations of the results.

**Discussion:** (Double spaced) This section contains your interpretation of the results you obtained. You can explain what you learned as a scientist (not as a student) from doing the exercise, whether or not the results you obtained were the expected results (and why you might not have obtained the expected results), and/or what might be extrapolated from the work you did. You may also compare your results to those obtained by other investigators and cite the references in which these scientists reported their experiments. Remember that data should **not** be included in the discussion section of your report but you may refer to your results section.

**References:** (Single spaced, 2<sup>nd</sup> line indented five spaces if APA style). This section should follow immediately after the discussion. List the references in alphabetical order by the last name of the first author of each reference. You must cite at least two references in each report. There are several standard formats for a list of references. Use a format consistent with one used in a scientific journal and must use the same format throughout the list. Two commonly accepted formats used are the American Psychological Association (APA) style <[www.apa.org](http://www.apa.org)> or the Council of Biology Editors (CBE)/Council of Science Editors (CSE) <[www.councilscienceeditors.org](http://www.councilscienceeditors.org)> documentation styles. Refer to style manuals for details on referencing and documentation formats. Some sample writing manuals are listed below:

- Pechenik, J.A.(2001). *A short guide to writing about biology*. New York: Longman.  
Raimes, A. (2000). *Pocket keys for writers*. Boston: Houghton Mifflin.  
Rosa, A. & Eschholz, P. (2003). *The writer's pocket handbook*. New York: Longman.  
Ruszkiewicz, J, Hairston, M. & Friend, C. (2002). *SF express*. New York: Longman.

Sample references in APA & CBE formats, for journals, books, and online articles follow:

**(Journal)**

Moffett, M. W. (2002). Ants and plants: Tree fortresses. *National Geographic*, 197, 84-97. (APA)

Moffett MW. Ants and plants: Tree fortresses. *National Geographic* 2002; 197: 84-97.(CBE)

Simon, H. A. (1974). How big is a chunk? *Science*, 183, 482-488. (APA)

Simon HA. How big is a chunk? *Science* 1974; 183: 482-488. (CBE)

Watson, J. D. & Crick, F. H. C. (1953). Molecular structure of nucleic acids. *Nature*, 171, 737-738. (APA)

Watson JD, Crick FHC. Molecular structure of nucleic acids. *Nature* 1953; 171: 737-738. (CBE).

**(Book)**

Brown, J. W. (1988). *The life of the mind*. Hillsdale, New Jersey: Erlbaum. (APA)

Brown JW. The life of the mind. Hillsdale, New Jersey: Erlbaum; 1988. 240 p. (CBE)

Crowcroft, J. W. (1966). *Mice all over*. Chester Springs, PA: Dufour. (APA)

Crowcroft JW. Mice all over. Chester Springs, PA: Dufour; 1966. 123 p. (CBE)

Luther, W. & Fiedler, K. (1965). *Guide de la faune sous-marine des cotes méditerranéennes*. Neuchâtel, Switzerland: Delachaux et Niestlé. (APA)

Luther W, Fiedler K. Guide de la faune sous-marine des cotes méditerranéennes. Neuchâtel, Switzerland: Delachaux et Niestlé; 1965. 322 p. (CBE)

**(Online)**

Online Publication with print equivalent:

Huxley, T. H. (1880). The physiology of the common crayfish. In *The Crayfish: An introduction to the study of zoology* [Electronic version]. Retrieved June 28, 2003, from [http://www.biology.ualberta.ca/old\\_site/palmer.hp/thh/crayfish.htm](http://www.biology.ualberta.ca/old_site/palmer.hp/thh/crayfish.htm). (APA)

Huxley T H. The physiology of the common crayfish. *The Crayfish: An introduction to the study of zoology*. [Electronic version]. Available from: [http://www.biology.ualberta.ca/old\\_site/palmer.hp/thh/crayfish.htm](http://www.biology.ualberta.ca/old_site/palmer.hp/thh/crayfish.htm) via the INTERNET. Accessed 2003 June 28. (CBE)

Online Publication with no print equivalent:

Jones, S. (2003). Essays: Cruel and unusual punishment: Painted glassfish. *Sea Adrift, the collected, creative musing and wanderings of Stacey Jones*, Retrieved June 28, 2003 from <http://jolieve.polestar.org/viewarticle.php?articleid=91>. (APA)

Jones S. Essays: Cruel and unusual punishment: Painted glassfish. *Sea Adrift, the collected, creative musing and wanderings of Stacey Jones*, Available from: <http://jolieve.polestar.org/viewarticle.php?articleid=91> via the INTERNET. Accessed 2003 June 28. (CBE)

### **General Safety Rules**

1. Students must be supervised at all times in the laboratory.
2. Immediately report any accidents or mishaps to your laboratory instructor.
3. Know the nearest location and proper use of the fire extinguisher, first-aid kit, chemical spill-kit, eye-wash, and safety shower.
4. Know the location of safety glasses, gloves, and plastic aprons. Use these safety items as necessary during laboratory periods.
5. No food or beverages are allowed in the laboratory.
6. For your own safety and that of others, discard all waste in the manner as directed in this laboratory manual and by your laboratory instructor.

## Safety and Housekeeping Rules

1. Know the location of the nearest fire extinguisher and first aid kit.
2. Report any mishaps to your teaching assistant.
3. DO NOT SMOKE or consume food or beverages in the lab rooms; take all breaks in the hall.
4. The lab room should be as clean (or cleaner) when you leave, as it was when you arrived.
5. Discard all wastes in the manner prescribed by your teaching assistant; **never** discard solid wastes in the sink.
6. Do not play with lab equipment or other lab materials.
7. Boiling water baths: use the beakers designated for this purpose unless instructed otherwise. Use a small amount of water—enough to cover the materials to be heated. Using a full beaker wastes both time and energy. Use test tube holders to remove tubes. Use the white plastic “hot hand” to move the beaker.
8. Dispose of dirty glassware as indicated below:
  - a) Glass slides and cover slips—labeled white plastic containers (Note: do not discard concave slides.)
  - b) Pasteur pipets and capillary tubes—labeled plastic container.
  - c) Graduated pipets—in the tall **pipet jar—tips down**.
  - d) Test tubes—wash them at the sink and place upside down to dry in test tube racks over a paper towel.
  - e) Beakers, flasks, etc.—clean and place on the draining racks.
  - f) Petri dishes (glass)—if they do **not** contain medium, rinse out. Stack dishes up in hood or in labeled pan for later removal. Remove labels.

## Your Bio206 Grade and CLEANLINESS

Cleaning up after oneself is an essential part of any experiment and is just as important as preparation, setup, and performance of the actual laboratory exercise.

Before your lab group may be excused upon completion of laboratory exercises, you are required to restore your laboratory workspace to its proper condition with items in their appropriate place, as you found them upon your arrival. Your lab space and materials should be as clean or cleaner than you found them.

Your laboratory instructor will be notified about the cleanliness of student work areas after each laboratory section.

### *STANDARD WASHING PROCEDURE*

1. Remove ink or tape labels or marks that you personally made. Use ethanol to remove ink.
2. Scrub items with warm soapy water.
3. Rinse repeatedly with tap water until soap is gone.
4. Inspect for cleanliness. If not clean, wash again.
5. Rinse twice with distilled water.
6. Drain excess water in sink.
7. Invert all items to dry *in designated location* for next class. Note, drying racks are provided for items that are easily tipped over.

**Graduated Glass Pipets:** After use, place graduated pipets in the large plastic pipet wash jar (near sink). Always *PLACE TIPS DOWN* to ensure proper cleaning. Be careful when inserting pipets because the pipet wash jar contains bleach.

**GLASS DISPOSAL:** Disposable Pasteur pipets, glass slides, and coverslips should be placed in the white plastic container labeled "*For Glass Disposal*". Only glass items should be placed in white containers, *never in the red sharps containers*). For occasional accidental breakage of glassware, collect all pieces with broom and dustpan and dispose of broken glass in the large cardboard box (near sink).

**METAL SHARPS DISPOSAL:** Razors, scalpel blades, and syringes with needles attached, and other METAL sharp items should be placed in the *Red plastic SHARPS containers*. Only metal sharps should be placed red SHARPS containers, *never any glass or plastic tips*.

**Plastic Pipette TIPS:** Plastic beakers are provided for convenient tableside disposal of plastic micropipetter tips and disposable transfer pipets.

**SPECIAL CIRCUMSTANCES:** During certain laboratory exercises, you may be given special instructions regarding disposal of hazardous materials, chemical solutions such as organic solvent wastes, or biological material such as animal carcasses and antibiotic-resistant bacteria. For your own safety and that of others, please follow these special directions carefully. If you are unsure of the proper procedure, **always ask questions!**