

Biology 141 Cell Biology and Genetics
Syllabus
Fall Semester 2008

Professor: Dr. M. Eloise Brown Carter
Office: Pierce Hall #107(side porch of Pierce)
Phone: (770)784-8343

Lecture Hours: Monday, Wednesday, Friday 9:35 a.m. – 10:25 a.m.

Room: Pierce 102

Lab Hours: Tuesday 2:30 – 5:30 p.m. **Room:** Pierce 125

Office Hours: Tuesday, 1:00 – 2:00 p.m. Monday and Wednesday – 10:30 to 11:30 a.m. Join Dr. Carter for “Walk and Talk on the Quad” or on “Porch Chats” during nice weather each Wednesday. Students are encouraged to see Dr. Carter during class to make appointments for other times.

Required Texts: *Biology*, N.A. Campbell and J.B. Reece, 2008, 8th edition, Benjamin/Cummings Publishing Co., Inc. The optional Study Guide is available on reserve in the library.

Practicing Biology, Heitz, Jean and C. Griffen. Benjamin/Cummings Publishing Co., Inc. 2008. A terrific workbook that is useful alone or in study groups.

Required Lab Text: *Investigating Biology*, 6th ed. Morgan, J. G. and M. E. B. Carter. Benjamin/Cummings Publishing Company, Inc. 2008. A customized edition published for BIO 141 is available in the bookstore. *Used lab manuals are not permitted.*

Optional Writing Book: *A Student Handbook for Writing in Biology*, Karen Knisely, 2005, 2nd edition, W.H. Freeman and Co. This is a great resource for writing, and is also on reserve in the library.

Web Site: *MasteringBiology* provides online study materials. www.masteringbio.com
Your text has instructions for accessing the site.

Date	Topic	Assigned Reading
W, Aug 27	Science as a Way of Knowing	1
F, Aug 29	Major themes in Biology	1
M, Sep 1	** Labor Day **	
W, Sept 3	Hierarchies: beginning with living chemistry and water	2,3
Thurs., Sep 4	<i>Scientific Literature and Research (Library - Required)</i> 8:00 – 8:45 am and 9:00 – 9:45 am	
F, Sep 5	Building biological macromolecules: carbohydrates and lipids	4,5
M, Sep 8	Proteins and nucleic acids	5
W, Sep 10	Structure and function revealed in cells	6
F, Sep 12	Cellular Case Studies	

M, Sep 15	Membrane structure and cellular transport	7
W, Sep 17	Transport problems	
F, Sep 19	Fundamentals of energy transformations: enzymes, ATP and electron carriers	8
M, Sep 22	Cellular respiration I - Glycolysis	9
Tues, Sep 23	EXAM I 8:00 - 9:30 a.m. (through membrane transport)	
W, Sep 24	Cellular respiration II - Transition and the Krebs Cycle	9
Thurs., Sep 25 th	<i>Presentation of Scientific Data – Pierce 123 (Required)</i> <i>8:00 - 8:45 am and 9:00 – 9:45 a.m.</i>	
F, Sep 26	Cellular respiration III - Chemiosmosis and the Electron Transport System	9
M, Sep 29	Review and recapitulation: Accounting Day	
W, Oct 1	Homage to photosynthesis;	
F, Oct 3	Photosynthesis I: the light dependent reactions	10
M, Oct 6	Photosynthesis II: the light independent reactions and variations (C4 and CAM)	10
W, Oct 8	Cell reproduction: cell cycle, mitosis	12
F, Oct 10	Sexual life cycles and meiosis	13
M, Oct 13	*** Fall Break***	
W, Oct 15	Chromosomal mutations	15 pp. 297-300
Thur, Oct 16	EXAM II – 8:00 – 9:30 a.m. (through photosynthesis)	
F, Oct 17	Mendelian principles; genes and chromosomes	14, 15 pp. 286-288
M, Oct 20	Patterns of inheritance	14, pp. 271-280
W, Oct 22	Chromosomal theory and linkage	15
F, Oct 24	Genetics problems and review <i>2-3 p.m., Effective Presentations Workshop - Pierce 206 (optional)</i>	14, 15
M, Oct 27	DNA structure	16
W, Oct 29	DNA replication	16
F, Oct 31	Gene to Protein I: transcription and the genetic code	17
M, Nov 3	Gene to Protein II: translation and genetic mutations	17
W, Nov 5	Molecular genetics workshop	
F, Nov 7	Charles Darwin and development of evolutionary concepts	22
M, Nov 10	Evidence for evolution	22,25, pp. 481-495
Tues, Nov 11	EXAM III - 8:00 – 9:30 a.m. (through genetics)	
W, Nov 12	Population Genetics and Hardy Weinberg	23
F, Nov 14	Microevolution: genetic drift, gene flow and mutation	23
	<i>Scientific Papers – “Ask the Experts”- 2:00 p.m. Library</i>	

M, Nov 17
W, Nov 19

Genetic variation and selection
Simulations – Evolution and population genetics
Research papers due in class
Speciation

23

F, Nov 21

24, pp. 487-501

M, Nov 24
W, F 22-24

Evolution of land plants:
** Thanksgiving Break **

29

M, Dec 1
W, Dec 3
F, Dec 5

Bryophytes and seedless vascular plants
Seed plants: gymnosperms and angiosperms
Evolutionary trends in land plants

29

30

M, Dec 8

The Big Themes Revisited

*** FINAL EXAMINATION *** Monday, December 15, 9:00 a.m. – 12:00 noon ***

CRIBSHEET #12

GENETICS

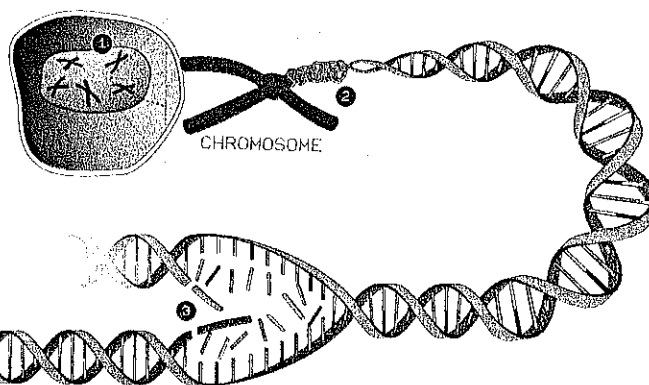
THE KEY QUESTION
IN GENETICS:

*How do living things
store and use the
information required
for their development
and behavior?*

From the largest creatures down to the smallest individual cells, all organisms rely on instructions for their development and behavior. These "blueprints" are carried in DNA, the molecule of life, transmitted through RNA, a closely related "helper" molecule, and expressed in proteins, molecules that are the building blocks of cells.

THE BASICS OF MOLECULAR GENETICS

Almost every cell in the body carries these instructions within its nucleus in structures called chromosomes ①. Each chromosome is actually a huge molecule of deoxyribonucleic acid (DNA) ② compressed to fit inside the nucleus. DNA is a molecule with two sugar-phosphate strands. These twist around each other to form a "double helix" structure, and are studded with four chemical compounds called bases: adenine (A), cytosine (C), guanine (G), and thymine (T). Adenine always bonds with thymine and cytosine always bonds with guanine to form complementary base pairs, meaning each molecule of DNA can reproduce itself indefinitely in a process called replication ③. During replication, DNA's strands unwind and act as templates. Then the bases on each strand attract their complementary bases, forming base pairs and making two identical copies of DNA. Replication creates the DNA for new cells, which are constantly generated as the body grows and renews itself.

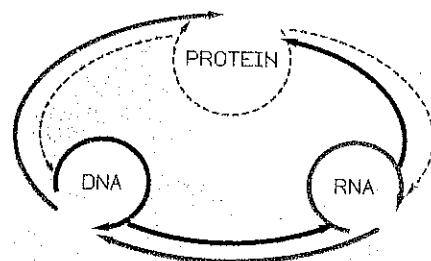


THE CENTRAL DOGMA OF MOLECULAR BIOLOGY

Throughout Nature
DNA → DNA
DNA → RNA
RNA → Protein

Special Circumstances
RNA → RNA
RNA → DNA
DNA → Protein

Unobserved
Protein → Protein
Protein → DNA
Protein → RNA



There are nine ways information can theoretically flow between DNA, RNA, and protein. Of these, three are seen throughout nature: DNA to DNA (replication), DNA to RNA (transcription), and RNA to protein (translation). Three more are known to occur in special circumstances like viruses or laboratory experiments (RNA to RNA, RNA to DNA, and DNA to protein). Flows of information from protein have not been observed. The trend is clear: information flow from DNA or RNA into protein is irreversible. This is known as the "central dogma," and forms the foundation of molecular biology.

SOUNDBITE

Information in living things is stored by DNA, transmitted by RNA, and expressed as proteins, which perform essential tasks within and outside cells.

Seed magazine

**BIOLOGY 141
LABORATORY SCHEDULE
Fall 2008
Dr. Eloise Carter
Dr. Nitya Jacob**

<u>Date</u>	<u>Lab Topic (#)</u>	<u>Writing Assignment*</u>
Sept. 2,3	Scientific Investigation	Title page; Introduction; References
9,10	Microscopes and Cells	Review table+
16,17	Diffusion and Osmosis	Materials and Methods
23,24	Enzymes	Table; Figures; Results (Results due 10/3 in class)
Sept. 30th (Tues.) LAB EXAM (thru enzymes) (8:00 – 9:15 a.m. or 8:30 – 9:45 a.m.)		
Sept. 30, Oct. 1	Cellular Respiration and Fermentation	Title page; Table; Discussion; References
7,8	Mitosis and Meiosis	Comparison Table+
14	***Fall Break***	
15,17	Meet in research groups Tuesday lab section, see instructor	Proposals submitted to conference by 8 a.m. on 10/20
21,22	Field Research: Ecology and Evolution on the Outcrops	
Oct. 28th (Tues.) LAB EXAM (Respiration, Mitosis and Meiosis, and outcrops) (8:00 – 9:15 a.m. or 8:30 – 9:45 a.m.)		
Oct. 28,29	Microbial Diversity (Bacteriology)	<i>Research papers due in class 11/17</i>
Nov. 4,5	Research Symposium (Technology Rehearsal – 9:00 a.m. – Location: TBA)	
Nov. 11,12	Molecular Biology	Map+
18,19	Plant Diversity I & II	
25,26	***Thanksgiving Break***	
Dec. 2,3	Molecular Phylogeny of Plants	Report completed in lab
Dec. 4th (Thurs.) LAB EXAM (8:00 – 9:15 a.m. or 8:30 – 9:45 a.m.)		

***Writing assignments are due one week later at the beginning of the lab period.**

*These assignments are not turned in for a grade.

STUDENT'S GUIDE TO BIOLOGY 141

Welcome to Biology 141! The information in this handout and accompanying materials should be read and followed by all students in Cell Biology and Genetics. If you do not understand everything in this handout, you should ask for clarification.

Introductory Biology (141) is designed for students who **plan to major in biology or neuroscience and behavioral biology**, attend **professional school in a health related field**, or have a **strong background in biology** and have chosen biology to fulfill their distribution requirements. This may be one of the more difficult courses you will take, demanding that you learn detailed and complex information, organize this information and apply your knowledge. This knowledge will be essential to your success in other biology courses, where your competence in fundamental biology will be assumed. Many of you will be taking examinations to enter graduate or professional schools, and the knowledge you gain here will be required for your success.

Course Objectives. The purpose of this course is to give you, the student, a firm foundation in the underlying themes of biology. You will study living organisms, cell structure and function, genetics and evolution. You will develop an understanding of the biochemical molecules that make up the structure of cells and how these molecules govern cell function. You will study the fundamentals of cell function, including transport across cell membranes, and energy transformation in living cells. Then you will explore cell reproduction, inheritance of biological traits and processing of genetic information. You will study the genetics of populations and how genes are responsible for evolution and biological diversity. Finally, a very important objective of this course is teaching you to "think and work like a scientist" through methods of scientific inquiry and the practice of scientific thinking. Both lecture and laboratory are designed to accomplish these goals with the two components of the course integrated through study, laboratory exercises, group work, scientific writing, and individual disciplined study.

Tips for Success: Biology 141 is an intensive course and requires time. If you are an average reader, you should spend about 8 hours a week outside class working in BIO 141. To perform well in this course, you must be diligent about the following:

- ✿ *Keep up with assigned readings.* The readings listed for each lecture in the syllabus must be done **BEFORE** the lecture. The best overall study **approach is to read assignments over quickly at first for an overview. Then read more carefully, jotting down questions or areas of confusion for later checking and review.**
- ✿ *Take good notes.* In lecture, I will explain the most significant concepts from your readings. At times, I will present examples that may not be given in your textbook. You are responsible for all of this information.
- ✿ *Connect the lecture notes to your readings.* For the test, you are responsible for information in the textbook as well as the lecture notes. Make sure that you are able to grasp the major concepts thoroughly and in detail.
- ✿ *Review material on a regular basis.* Study the diagrams in your text and lecture handouts. Practice writing out pathways and link the concepts. It is helpful to **prepare your own tables and diagrams** as a study aid and review for much of the material in BIO 141. Attend your SI sessions on a regular basis. Take advantage of my office hours to get individual assistance.
- ✿ *Memorize and think.* While studying, keep two things in mind: One is to **master the facts of biology** and most importantly, understand the connections among these biological facts. Second – it is crucial to remember that this course is designed to make you **think** and not just to have you memorize facts. Learning the facts is important to establish a knowledge base, but it is not sufficient! You must be able to apply your

knowledge to think logically and analytically. Therefore you should be confident of what you know, what it means, and how it relates to major themes in biology.

- ❧ *Be an active learner.* Develop study guides, comparison charts, concept maps. Use the MasteringBiology web resources provided with your textbook. Attend Supplemental Instruction and organize your own active study group. **Don't be lulled into thinking familiarity is the same as knowledge.** The latter takes time and hard work!
- ❧ *Be prepared for laboratory and invest time and effort in lab each week.* Read the lab and review terminology and diagrams BEFORE lab each week. During lab complete all components of the lab. Take good notes and make detailed observations. Answer all questions in the lab manual during or after lab. After lab review the objectives and prepare a study guide for the lab materials and activities. Be serious about completing the writing assignments!

Supplemental Instruction. is provided for all students in BIO 141. The instructor will explain this important program that provides assistance for all students who wish to improve their performance in biology. Your BIO 141 SI leader is Ross Powers this semester.

Examinations. There will be three lecture exams (100 pts. each) that will be a combination of multiple choice, short answer and short essay questions. Exams will cover all material covered in lecture in addition to assigned readings in the text. The final examination is comprehensive (175 pts.). There are three laboratory practical exams that include a written portion (50 pts. each). These exams cover the laboratory topics and exercises. Students should feel free to ask for clarification about any question during the exams.

Scientific Writing and Laboratory Project. Students will write individual sections of a scientific paper for specific laboratory exercises. Students will propose and implement an independent investigation as a team research project. For this laboratory, you will prepare a group symposium presentation and write an individual complete scientific paper. Specific instructions will be provided in lab.

Honor Code. All examinations and work for credit in this course come under the regulations of the Honor Code. Your signature on your work attests to your upholding the Honor Code. Please ask if you have any questions about an assignment.

Absences. The policy on absences is provided in a separate handout. Unexcused absences or a failure to follow the procedures outlined in that handout **will result in a reduction in your grade.** Any questions about absences should be asked immediately. This is essential for the laboratory portion of the course.

Evaluation. Students are evaluated on their performance in the classroom and laboratory. The assignment of points will be:

300 points	3 lecture exams
150 points	3 laboratory exams
175 points	final examination
40 points	scientific writing
60 points	lab project

725 points total

Final grade determination:

90 – 100%	A
80 – 89%	B
70 – 79%	C
60 – 69%	D
<60	F

Plus and minus grades are given



When the monster came, Lola, like the peppered moth and the arctic hare, remained motionless and undetected. Harold, of course, was immediately devoured.

ABSENCE POLICY - Biology Department

All students are expected to attend all lecture and laboratory sessions. However, emergencies may arise which will necessitate absences from class. Students are allowed 4 cuts in lecture and NO CUTS in lab. Students may only miss lab without penalty in cases of illness, family emergency or a school sponsored event which is cleared with the professor in advance. Students are responsible for all material which is covered in laboratory and lecture. When possible, students will be allowed to "make-up" laboratory material missed due to an excused absence, however, because of the nature of laboratory material, actual "make-up" of missed activities is usually impossible.

PENALTIES

Students who exceed the 4 cut limit in lecture for whatever reasons or have an unacceptable absence from laboratory will have their FINAL grade reduced 5 points per absence. Students who miss 2 labs without acceptable reasons will fail the course (see below).

LECTURE ABSENCES:

THERE ARE NO EXCUSED ABSENCES FOR LECTURE. Each student may be absent four times without penalty. These four cuts may be used for any reason: illness, studying, travel, family emergency, etc. However, ANY additional cuts will result in grade reduction. USE YOUR CUTS JUDICIOUSLY, e.g. for sick leave only.

ACCEPTABLE LABORATORY ABSENCES

Although no discretionary absences, i.e. "cuts", are allowed regarding laboratory, on rare occasions, illness, family emergencies, or certain school sponsored events may make it necessary for a student to miss a laboratory session. The instructor MUST be notified prior to the day of the absence in all but the most extreme emergencies.

In all cases, the final decision regarding whether or not an absence is acceptable will be made by the instructor.

AN UNACCEPTABLE ABSENCE FROM LABORATORY RESULTS IN A FIVE POINT REDUCTION IN THE FINAL GRADE. TWO UNACCEPTABLE LABORATORY ABSENCES RESULT IN FAILURE OF THE COURSE.

MISSED TESTS

Ordinarily, tests cannot be made up, however, this is up to the instructor. If a student misses a test, and the absence is acceptable the missed test will not count either for or against the student. If the absence is not excused the grade will be a zero. Students are cautioned that any excuse for missing an exam will come under severe scrutiny by the instructor. THE INSTRUCTOR MUST BE NOTIFIED PRIOR TO THE TIME OF THE EXAM, AND THE INSTRUCTOR MAKES THE FINAL DECISION REGARDING WHETHER OR NOT AN ABSENCE IS ACCEPTABLE.

Laboratory tests which are missed for a reason that is excused MUST be made up. The instructor must be notified prior to the time of the test.

RELIGIOUS HOLIDAYS:

Students must notify the instructor one week in advance if they intend to be absent for a religious holiday.

TARDINESS

Being late to class is rude and distracting. Continued tardiness by any student will result in the assignment of absences and ultimately a reduction in the student's grade. Three tardies equal an absence. The tardy student is responsible for notifying the instructor that she/he entered the classroom late and, therefore, was not absent. The instructor reserves the option of excluding a person from further classroom or laboratory participation if the student is continuously tardy.

Falsification of information regarding absences from class or laboratory will be considered as a breach of academic integrity.

CLASSROOM AND LABORATORY GUIDELINES

Department of Biology

- I. Eating and drinking are not allowed in either classrooms or laboratories. Therefore, do not bring food items and beverages to class or laboratory. Remember that the use of tobacco in any form is forbidden in Pierce Hall.
- II. Students are expected to wear appropriate attire in classrooms and laboratories. This certainly includes the wearing of shoes.
- III. Students must be safety conscious at all times but especially in the laboratories. Special procedures will be reviewed during laboratory sessions as needed.
- IV. All students are requested to help with housekeeping in the classroom and laboratory.
- V. In Biology 142, 121, and 122 certain designated dissection specimens may be taken from the laboratory with the instructor's permission. The instructor will identify those specimens which may be removed for study elsewhere. These specimens **must** be returned on or before the time the instructor announces for their return.
- VI. Except for the exceptions noted above (V) materials may not be taken out of the laboratories. This includes microscopes, microscopic slides, demonstration notes and materials, charts, and all other items which are to be found in the laboratory.
- VII. Violation of any regulation noted in Sections V and VI above will be treated as a breach of academic integrity. Therefore, such violations will be immediately reported to the Honor Council.