

BIOL 1107: Principles of Biology I (Fall Semester 2013)

Lecture (BC 1011): Tuesday, Thursday 2:00 – 3:15 p.m.

Laboratory (BC 1083/1085): Sections G-L

Instructor: Dr. Gretchen Bielmyer

Office: BC 1097

Office hours: Tues., Thurs. 11:00 am – 12:00 pm; 3:15– 4:00 pm, or by appointment

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NOTE: I have an open door policy. Please stop by my office anytime you have questions, concerns, ideas, need advice, etc. To request alternative appointments, please email me directly.

Welcome to Principles of Biology I. This is the first course in a series designed to help you develop a strong foundation in the biological sciences to build on throughout your studies at VSU and beyond.

BIOL 1107 Course Description. An introduction to the principles of biology for science majors, with an emphasis on the cellular nature of life. Concepts covered include cell structure, function, metabolism, and reproduction; genetics; cell signaling; and the evolutionary relationship of cells. There are no prerequisites for this course. BIOL 1100 is a co-requisite for incoming Biology majors.

Course Objectives: The goal of this course is to stimulate student learning of these basic concepts and to encourage contemplation of the significance of each concept to the general field of biology.

Learning Goal:

- Students will demonstrate understanding of the physical universe and the nature of science, and they will use scientific methods and/or mathematical reasoning and concepts to solve problems.

Educational Outcomes:

- Develop and test hypotheses, collect and analyze data, and present the results and conclusions
- Exhibit an understanding of basic biological chemistry
- Describe the evolutionary processes responsible for biological diversity, explain the phylogenetic relationships among the major taxa of life, and provide examples
- Demonstrate an understanding of the cellular basis of life

Required Materials:

- **Text:** Sadava, D., Heller, H.C., Orians, G.H., Purves, W.K., Hillis, D.M. 2014. LIFE: The Science of Biology. Tenth (or ninth) Edition. Sinauer Associates, Inc., Sunderland, MA, and W.H. Freeman & Co., Gordonsville, VA. ISBN 978-0-7167-7671-0
- **Clicker**
- **Lab Manual:** Goddard, R.H. 2010. Methods and Investigations in Basic Biology, Sixth Edition.

Attendance: Attendance in lecture is expected by all students. Attendance in laboratory is mandatory; see lab policy.

ABSOLUTELY NO LECTURES OR LABORATORIES CAN BE "MADE UP".

Access to Slides/Information: Lecture slides will be made available on BlazeView by 5:00 pm the day before lecture. These slides will not have all the information on them; it is the student's responsibility to come to class and take notes. Students are responsible for getting the notes from other students if they miss a lecture. The professor will NOT email notes that are missed.

Lecture Conduct:

- Arrive on time.
- Turn off cell phones during class and lab; there is no reason you should be texting or calling anyone.
- Don't talk during lecture; if you don't understand something or didn't hear something ask.
- If you would like to use a laptop to take notes, please sit in the first two rows.
- Laptops & related tools are allowed for note taking only
- Turn off your MP3 player and remove your earbuds/headphones during lecture.

- Unless it's an emergency (and using your cell phone does not constitute an emergency) do not get up in the middle of lecture, leave and come back.
- During exams NOBODY can leave the exam and re-enter the exam room. If a student leaves, their exam will be graded as if; the student will not be allowed to finish the exam.

Grade Assessment: Your final grade will be based on your performance on lecture examinations and the laboratory. Additional unannounced research and writing assignments may be assigned to count toward the final grade during the semester.

Lecture: (500 pts)

Exams. There will be four lecture exams followed by a cumulative final. Students are required to learn the lecture material and the readings from the text for all exams. Related information presented in the laboratory may also be included in exams. Exam format will be specified by your instructor. The unit exams are not cumulative. The final will be cumulative and will have a format similar to the other exams. Each of the unit exams and the final exam will be worth 100 points. The dates for the exams are included in the Tentative Class Schedule. Note, that these are TENTATIVE, therefore the professor reserves the right to adjust the dates of the exams. The lowest exam score (excluding the final) will be dropped. **Therefore, no make-up exams will be given.** If you miss one exam for any reason, then that exam score will be dropped from your overall grade. If you miss more than one exam then you will receive a zero on the missed exam(s). Only students with a University related excuse may take an exam early.

YOU MUST BRING A PENCIL WITH YOU TO THE EXAM. All cell phones must be turned off during exams. No books, electronic devices, or notebooks will be allowed during exams. All book bags, books, purses etc. must be placed on the stage (in the front of the room) at the start of the exam; NO EXCEPTIONS. If you do not feel comfortable putting your purse, bag, books, etc. on the stage don't bring them with you to class. Hats cannot be worn during exams. No talking will be allowed during the exam, but students are permitted to ask the instructor questions. You will have the class time only to complete each lecture exam.

Pooled Clicker Grade. Beginning in the second week of class, lectures will include an assessment using clicker questions. Each correct answer will count 2 points, incorrect answers will count 1 point, and questions that are not answered will count 0 points. *Individual clicker assessments* will be posted to Blazeview the day following the lecture. At the end of the semester, a *Pooled Clicker Grade* will be calculated as the average percentage of all clicker quizzes and will equal one exam grade (cannot be dropped). Extra clicker quizzes will be given to account for missing one quiz or forgetting your clicker.

** The Pooled Clicker Grade will be scored as zero if you allow someone to use your clicker in your absence, or if you use someone's clicker in his or her absence.*

To assess your lecture grade divide the total points earned by the total possible points & multiply by 100.

Table 1.

Exam 1	Exam 2	Exam 3	Exam 4	Clicker Quizzes	Final Exam	Total - Lowest Exam
100	100	100	100	100	100	500

Use the empty second row in the table above to keep track of your individual points and lecture percentage at any point in the semester.

Laboratory: Your laboratory grade is worth 25% of your overall grade.

Grade Calculation & Distribution:

To calculate your overall grade use the following equation:

$$(\text{Lab percentage grade} \times 0.25) + (\text{lecture percentage grade} \times 0.75) = \text{Overall percentage grade}$$

Grade Scale: For Biology majors, a grade of C or higher is required for this course.

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

Notes on grading: Students should note that a grade of "A" in this course represents an exemplary command of the material covered. To obtain this grade of excellence, it is recommended that students study daily and clarify with their instructor any problems regarding course information, as they arise.

Mid-term, or in-progress grades: The instructor is required to submit in-progress grades prior to mid-term as posted

(09/26//2013). In theory, a mid-term grade is necessary for a student to assess how s/he is doing in class by midterm. In this course, students will have feedback on at least one major exam by midterm, several lab quizzes, lab assignments, and any homework or writing assignments. The instructor will, in general, assign an overall average grade at this point on the normal scale of A-F viewable on Banner. Students receiving a grade of “D” or lower should therefore carefully evaluate their option of dropping this course by midterm without academic penalty.

Student identification: Students should have in their possession at all times their VSU student identification card. In order to verify the identification of students officially enrolled in the course, it is the instructor’s prerogative to request official student photo identification cards at any time during lecture. During examinations, students will routinely be asked to display their VSU student identification cards visibly on the desk top and to make them available for inspection by their instructor and/or assistants.

Privacy Act (FERPA): The Family Educational Rights and Privacy Act (FERPA) prohibit the public posting of grades by social security number or in any manner personally identifiable to the individual student. No grades can be given by email or over the telephone, as positive identification cannot be made by this manner.

Academic conduct: Cheating and plagiarism will not be tolerated and may result in a failing grade for the assignment, exam or the class. Additionally, students caught cheating will be reported to the Dean of Students. Please see the Department of Biology’s plagiarism policy.

Disruptive behavior: No disruptive behavior of any kind will be tolerated in this course. Students should restrict talking and discussion to pertinent questions related to course material and these questions should be directed toward the instructor. Entering a classroom late or early is discouraged. Any student disrupting lectures will be required to leave the classroom. Use of cellular telephones, pagers, or any similar remote communication device is prohibited during scheduled lectures, laboratories, or examinations. If students bring cellular telephones or similar devices to lecture, it is their responsibility to switch them off prior to the beginning of the lecture period.

Biology Tutoring: The Student Success Center (SSC) at Valdosta State University is located in Langdale Residence Hall above the Tech Shop and is available to all students. The SSC provides free peer tutoring in core curriculum courses, including biology, chemistry, math, writing, and foreign languages. The SSC also provides free professional academic advising and on-campus job information in one location. Call 333-7570 to make an appointment, or visit the website: www.valdosta.edu/ssc.

Students with Disabilities: Students requesting classroom accommodations or modifications because of a documented disability must contact the Access Office for Students with Disabilities located in room 1115 Nevins Hall. The phone number is (229) 245-2498.

TENTATIVE LECTURE OUTLINE: Chapters in Life are listed for 9th or 10th edition.

Date:	Topics:	Chapters:
August 13 (T)	Introduction to Biology	1
August 15 (TH)	Introduction to Biology	1
August 20 (T)	Chemistry of Life	2
August 22 (TH)	Chemistry of Life	2
August 27 (T)	Proteins, carbohydrates, and lipids	3
August 29 (TH)	Proteins, carbohydrates, and lipids	3
Sept. 03 (T)	Nucleic acids and the origin of life	4
Sept. 05 (TH)	EXAM # 1	1-4
Sept. 10 (T)	Cells	5
Sept. 12 (TH)	Cells	5
Sept. 17 (T)	Cell membrane	6
Sept. 19 (TH)	Cell membrane	6
Sept. 24 (TH)	Cell communication	7
Sept. 26 (T)	Cell communication	7
Sept. 27 (TH)	Review	
Oct. 01 (T)	EXAM # 2	5-7
Oct. 03 (TH)	Energy, Enzymes, & metabolism	8
Oct. 01 (T)	Energy, Enzymes, & metabolism	8
Oct. 03 (TH)	Pathways that harvest chemical energy	9
Oct. 08 (T)	Pathways that harvest chemical energy	9
Oct. 10 (TH)	Photosynthesis	10
Oct. 15 (T)	Photosynthesis	10
Oct. 17 (TH)	Review	
Oct. 22 (T)	EXAM # 3	8-10
Oct. 24 (TH)	Cell cycle, and cell division	11
Oct. 29 (T)	Cell cycle, and cell division	11
Oct. 31 (TH)	Inheritance, genes, and chromosomes	12
Nov. 05 (T)	DNA and role in heredity	13
Nov. 07 (TH)	DNA to protein: gene expression	14
Nov. 12 (T)	DNA to protein: gene expression	14
Nov. 14 (TH)	Gene mutation & molecular medicine	15
Nov. 19 (T)	NO CLASS; STUDY FOR EXAM	
Nov. 21 (TH)	EXAM # 4	11-15
Nov. 26 (T)	THANKSGIVING HOLIDAY; NO CLASSES	
Nov. 28 (TH)	THANKSGIVING HOLIDAY; NO CLASSES	
Dec. 04 (W)	FINAL EXAM 2:45-4:45 pm (BC 1023)	Cumulative

<p>Generalized Eukaryotic Cell</p> <p>A. NUCLEUS</p> <ol style="list-style-type: none"> Defining characteristics: membrane bound nucleus, presence of organelles, meiotic division Nucleus: compartmentalization, storage of genetic information Nucleolus: location and function Nuclear envelope, nuclear pores <p>B. MEMBRANE-BOUND ORGANELLES</p> <ol style="list-style-type: none"> Mitochondria <ol style="list-style-type: none"> site of ATP production self-replication inner and outer membrane Lysosomes: membrane vesicle containing hydrolytic enzymes Endoplasmic reticulum: <ol style="list-style-type: none"> rough and smooth components rough endoplasmic reticulum site of ribosomes double membrane structure, role in membrane biosynthesis role in biosynthesis of secreted proteins Golgi apparatus: general structure and role in packaging and secretion <p>C. PLASMA MEMBRANE</p> <ol style="list-style-type: none"> General function in cell containment Protein and lipid components, fluid mosaic model Osmosis Passive and active transport Membrane channels Sodium/potassium pump Membrane receptors Membrane potential Exocytosis and endocytosis Cell-cell communication (General concepts of cellular adhesion) <ol style="list-style-type: none"> gap junctions tight junctions desmosomes <p>D. CYTOSKELETON</p> <ol style="list-style-type: none"> General function in cell support and movement Microfilaments: composition and role in cleavage and contractility Microtubules: composition and role in support and transport Intermediate filaments, role in support Composition and function of eukaryotic cilia and flagella Centrioles, microtubule organizing centers 	<p>Biological Molecules</p> <p>A. CARBOHYDRATE</p> <ol style="list-style-type: none"> Description <ol style="list-style-type: none"> nomenclature and classification, common names absolute configuration cyclic structure and conformations of hexoses imers and anomers Hydrolysis of the glycoside linkage <p>B. AMINO ACIDS AND PROTEINS</p> <ol style="list-style-type: none"> Description <ol style="list-style-type: none"> absolute onfiguration at the α position amino acids as dipolar ions classification classification <ol style="list-style-type: none"> acidic or basic hydrophobic or hydrophilic Reactions <ol style="list-style-type: none"> peptide linkage hydrolysis General principles <ol style="list-style-type: none"> 1° structure of proteins 2° structure of proteins <p>C. LIPIDS</p> <p>Description; structure</p> <ol style="list-style-type: none"> steroids terpenes triacyl glycerols free fatty acids <p>D. PHOSPHORUS COMPOUNDS</p> <ol style="list-style-type: none"> Description <ol style="list-style-type: none"> structure of phosphoric acids (anhydrides and esters) Important reactions <ol style="list-style-type: none"> Wittig reaction <p>MITOSIS</p> <ol style="list-style-type: none"> Mitotic process: prophase, metaphase, anaphase, telophase, interphase Mitotic structures: <ol style="list-style-type: none"> centrioles, asters, spindles chromatids, centromeres, kinetochores nuclear membrane breakdown and reorganization mechanisms of chromosome movement Phases of cell cycle: G_0, G_1, S, G_2, M Growth arrest
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<p>Molecular Biology: Enzymes and Metabolism</p> <p>A. ENZYME STRUCTURE AND FUNCTION</p>	<p>Molecular Biology: Eukaryotes</p> <p>A. EUKARYOTIC CHROMOSOME ORGANIZATION</p>	<p>Evolution</p> <p>A. EVOLUTION</p>
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<ol style="list-style-type: none"> 1. Function of enzymes in catalyzing biological reactions 2. Reduction of activation energy 3. Substrates and enzyme specificity <p>B. CONTROL OF ENZYME ACTIVITY</p> <ol style="list-style-type: none"> 1. Feedback inhibition 2. Competitive inhibition 3. Non-competitive inhibition <p>C. BASIC METABOLISM</p> <ol style="list-style-type: none"> 1. Glycolysis, anaerobic and aerobic, substrates and products 2. Krebs cycle, substrates and products, general features of the pathway 3. Electron transport chain and oxidative phosphorylation, substrates and products, general features of the pathway 4. Metabolism of fats and proteins <p>Molecular Biology: DNA and Protein Synthesis</p> <p>I. DNA STRUCTURE AND FUNCTION</p> <p>A. DNA STRUCTURE AND FUNCTION</p> <ol style="list-style-type: none"> 1. Watson-Crick model of DNA; double helix 2. DNA composition: purine and pyrimidine bases, sugars, phosphate 3. Base pairing specificity: A w/ T, G w/ C 4. Function in transmission of genetic information <p>B. DNA REPLICATION</p> <ol style="list-style-type: none"> 1. Mechanism of replication: separation of strands, specific coupling of free N. acids 2. Semi-conservative nature of replication <p>C. REPAIR OF DNA</p> <ol style="list-style-type: none"> 1. Repair during replication 2. Repair of mutations <p>D. RECOMBINANT DNA</p> <ol style="list-style-type: none"> 1. Restriction enzymes 2. Hybridization 3. Gene cloning <p>II. PROTEIN SYNTHESIS</p> <p>A. GENETIC CODE</p> <ol style="list-style-type: none"> 1. Central Dogma: DNA → RNA → protein 2. Codon-anticodon relationship 3. Missense, nonsense codons 4. Initiation, termination codons <p>B. TRANSCRIPTION</p> <ol style="list-style-type: none"> 1. Messenger RNA 2. tRNA, rRNA 3. Mechanism of transcription <p>C. TRANSLATION</p> <ol style="list-style-type: none"> 1. Roles of mRNA, tRNA, rRNA 2. Role and structure of ribosomes 	<ol style="list-style-type: none"> 1. Chromosomal proteins 2. Telomeres, centromeres <p>B. CONTROL OF GENE EXPRESSION IN EUKARYOTES</p> <ol style="list-style-type: none"> 1. Transcription regulation 2. DNA binding proteins, transcription factors 3. Cancer as a failure of normal cellular controls, oncogenes 4. Post-transcriptional control [GEC] <p>Genetics</p> <p>A. MENDELIAN CONCEPTS</p> <ol style="list-style-type: none"> 1. Phenotype and genotype 2. Gene 3. Locus 4. Allele: single and multiple 5. Homo- and heterozygosity 6. Wild type 7. Recessiveness 8. Complete dominance 9. Co-dominance 10. Incomplete dominance, leakage, penetrance, expressivity 11. Gene pool <p>B. MEIOSIS AND GENETIC VARIABILITY</p> <ol style="list-style-type: none"> 1. Significance of meiosis 2. Important differences between meiosis and mitosis 3. Segregation of genes <ol style="list-style-type: none"> a. Independent assortment b. linkage c. recombination d. single crossovers e. double crossovers 4. Sex-linked characteristics <ol style="list-style-type: none"> a. very few genes on Y chromosome b. sex determination c. cytoplasmic inheritance 5. Mutation <ol style="list-style-type: none"> a. general concept of mutation-error in DNA sequence b. types of mutations: random, translation error, transcription error, base substitution, inversion, addition, deletion, translocation, mispairing c. advantageous vs. deleterious mutation d. inborn errors of metabolism e. relationship of mutagens to carcinogens] <p>C. ANALYTIC METHODS</p> <ol style="list-style-type: none"> 1. Hardy-Weinberg Principle 2. Test cross: back cross, concepts of parental, F1 and F2 generations 	<ol style="list-style-type: none"> 1. Natural selection <ol style="list-style-type: none"> a. fitness concept b. selection by differential reproduction c. concepts of natural and group selection d. evolutionary success as increase in percent representation in the gene pool of the next generation 2. Speciation <ol style="list-style-type: none"> a. definition of species b. polymorphism c. adaptation and specialization d. concepts of ecological niche, competition e. concept of population growth through competition f. inbreeding g. outbreeding h. bottlenecks i. divergent, parallel, and convergent evolution j. Symbiotic relationships <ol style="list-style-type: none"> a. Parasitism b. Commensalism 3. Ontogeny recapitulates phylogeny 4. Evolutionary time as measured by gradual random changes in genome 5. Origin of life
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