Biology 151 Principles of Cellular and Molecular Biology

Instructor Information:

Instructor	Dr. Kristopher Blee
Office	Holt 301H
Office hours	Tu-F 1-2 pm
Phone	898-5116
email	Biology 151 VISTA email tool

Required Items:

1. A USB-flashdrive-memory stick.
2. Permanent fine tip marker for labeling tubes, seriously, get your own pen.
3. Biology 151 Lab course manual (purchase form Omicron, on second floor of Holt Hall near mountain lion).
4. Bound Laboratory Notebook (Composition style/Quad ruled).
5. Sadava et al., 8th ed. 2008. Life the Science of Biology.

Course Assignments:

1. Reading. Reading is scheduled below from the text and / or journal articles that have been posted on the course VISTA site. Students should read the assigned material prior to coming to class.

2. Quizzes. Quizzes are taken online. They are timed and consist of 10 questions (for a total of 10 points) taken from the previous/current/near future reading, lecture, and lab material. Questions are multiple choice and / or fill in the blank and / or short answer. Once a quiz is assigned, take the quiz well before the deadline. Do not put off taking a quiz until the last minute, if you do and your computer crashes or you run out of time or etc. this is by your choice. Instead always attempt the quiz early enough, so if you have a problem you can notify me in class and I can make required changes and you still have time to complete the quiz as required. Quizzes are to be your personal efforts and no one else's. While taking the quiz you may use your notes, VISTA Biology 151 course materials, and your text book. Discussion of quiz questions with other students who have not yet taken the quiz or providing students copies of quiz questions are considered a breach of academic honesty, and if detected will be treated as such.

3. Lab Notebook. You will keep a lab notebook which will be evaluated twice as scheduled. The notebook will have a table of contents where the title of each lab is listed along with the date performed and the page number that lab entry can be found at. Entries from each lab period into your lab book will always begin on a right page with the left page empty. Entries contain: introductory and procedural comments your instructor makes about a lab; your question and hypotheses if appropriate, the exact protocol you used (you may reference your lab manual but record changes); any and all raw data as well as summarized data with titles and legends for tables, graphs, and figures; all numerical values should have units; statistical treatments of the data or other analysis and a conclusion. Legible notebooks that adequately meet all these requirements will receive 15 pts. Illegible, unorganized, and / or incomplete notebooks will receive less than 15 pts. Notebooks with exemplary detail and organization displaying obvious extra effort may receive up to 20 pts.

4. Exams. Four lecture and four lab exams. Both lecture and lab exams for a given date will be administered during the lecture hour. Exams contain multiple choice, definitions, short answer, and data analysis/synthesis questions.

5. Lab transparency presentations. Transparency presentations are group presentations of on one or two transparencies prepared by the group. The transparency presentations are of student research investigations performed in the lab. The pages of the transparency include the research question, hypotheses, properly formatted summary data table or figure, a statistical evaluation when applicable, and a conclusion. Each member of the group presents some portion of the material. To receive a grade for the assignment a student must be present for the preparation and presentation. Lab assignment due dates are bold on the course schedule. Transparencies will each be scored out of 5 pts possible. Work that is correct in every sense and meets all requirements of the assignment will receive 4 pts. Incorrect work or incomplete work will receive less than 4 pts. Excellent work displaying obvious extra effort may receive up to 5 pts.

6. Individual lab assignments. Over the course of the semester you will be individually assigned problem sets and writing assignments. You are to complete these assignments on your own, use of the work from others will be considered a breach of academic honesty, and if detected will be treated as such. These assignments are scored either out of 5 or 10 pts possible (depends on assignment). Work that is correct in every sense and meets all requirements of the assignment will receive 80% of the pt maximum. Incorrect work or incomplete work will receive less than 80%. Excellent work displaying obvious extra effort may receive up to 100%.

7. **Group lab research paper.** You and your group will be required to write up and submit a formal written report on one of your lab research investigations. You will follow guidelines for scientific writing and include sections for the abstract, introduction, methods, results, discussion, and conclusions. More information on what each of these sections contains is available in the appendix of you lab course manual. You lab instructor will also go over the assignment. All members of your group are expected to contribute somewhat equally in the preparation of the assignment. You should try to complete a draft and turn it in to your lab instructor for suggestions on improvement. You lab instructor will make suggestions, you should use these to guide improvements so you final draft might receive a good grade. Your group's efforts will be evaluated with respect to how well you cover criteria required within each section (for example criteria required in each of the following, the abstract, introduction, methods, results, discussion, and conclusions). Papers adequately meeting all criteria for each section receive 15 pts. Superior papers oozing obvious extra effort may earn up to 20 pts.

Course Assignments and Value	**Point Value**
Quizzes (10 at 10 pts each, best 10 scores out of 11)	100
Exams (4 lab at 25 pts each, 3 lecture at 25 pts each, 1 lecture final at 75 pts)	250
Lab assignments (various at 5 or 10 pts each)	90
Lab notebook (2 at 20 pts each)	40
Group paper	20
Total Course Points	500

Percentage of Correct Points and Grade	**Letter Grade**
90 to 92 to 100%	A- to A
80 to 82 to 87 to 89%	B- to B to B+
70 to 72 to 77 to 79%	C- to C to C+
63 to 67 to 69%	D to D+
less than 63%	F
unauthorized withdraw	WU

Course Policies:

1. **Exam attendance.** Make-up lecture exams will not be given unless previous arrangements have been made.

2. **Laboratory attendance**. Experimental design and experimentation are very important in biology – your attendance at weekly labs is expected. If you are unable to attend a lab, notify the laboratory instructor and try to attend another section that week. Absences from lab will affect your grade. There will be no penalty for one absence, however, your laboratory grade will be lowered by 20 points for each absence after that.

3. **Dropping**. You may drop this course during the first 2 weeks by TRACS, and during the 3rd and 4th weeks with a drop card signed by the instructor. After the Census Date of the 4th week, a drop requires a "serious and compelling" reason. Therefore, before you request a late drop for this class, obtain written documentation of your reason for withdrawal. I will not consider any late drop without professional (Ex. Physician) verification of "serious and compelling" reason.

4. **Students with disabilities**. Additional efforts can be made to increase access of course materials for students with permanent and temporary disabilities. If you are disabled contact CSU Chico Disability Support Services (www.csuchico.edu/dss/index.shtml or University Center Room 100 or 898-5959) for help and notify your instructor as soon as possible.

Course Schedule Biology 151 Fall 2009

wk	date	section	lecture	text	lab
1	Aug24 Aug26 Aug28	I Biomolecules	Course introduction What are proteins, what do they do? Furlough **Q1**	ch3 p38-48	Photosynthesis
2	Aug31 Sep2 Sep4		How do enzymes work? How are enzymes regulated? Furlough **Q2**	6 6	Protein assay **Photo trans** **App F**
3	**Sep7** Sep9 Sep11		**Labor Day No Classes** What are carbohydrates? What are lipids? **Q3**	 ch3 p49-53 ch3 p54-57	CSU ADMIN FURLOUGH NO LABS
4	Sep14 Sep16 **Sep18**		What are nucleic acids? Review for Exam **EXAM 1 (lab / lecture) / census date**	ch3 p57-60	Standard curves
5	Sep21 Sep23 Sep25	II Cell Types, Their Structures and Functions	How is DNA replicated? What basic cell types are there? What do prokaryotic cells look like? **Q4**	ch11 p232-248 p560-577, 588-590 ch4 p68-74	Enzyme assay **Protein trans**
6	Sep28 Sep30 Oct2		What do eukaryotic cells look like? What do the components of a cell do? How are proteins secreted? **Q5**	4 4 4	Specific activity, Peroxidase Lit
7	Oct5 Oct7 Oct9	III Signal Transduction	What is the plasma membrane? How molecules move in / out-of cells? How do cells perceive signals? **Q6**	5 5 15	Genevest' & PSORT **Text+ref, questions** **Nbook I**
8	Oct12 Oct14 Oct16		How do cells respond to signals? What is a gene? **Exam 2 (lab and lecture)**	15 12	CSU ADMIN FURLOUGH NO LABS
9	Oct19 Oct21 Oct23	IV Gene Expession	How do genes work? Control of expression in bacteria How do eukaryotes express genes? **Q7**	12 ch13 p296-305 14	Oligo' design **Figs(3) legends text** **Oligos, Seq revised**
10	Oct26 Oct28 Oct30		What is fermentation? What is aerobic respiration? Furlough **Q8**	7 7	Isolate DNA, PCR **Group paper draft**
11	Nov2 Nov4 Nov6		Furlough What fuels cellular respiration? How is metabolism regulated? **Q9**	 7 7	Gel electrophoresis **PCR product sizes**
12	Nov9 **Nov11** Nov13	V Metabolism	How does photosynthesis reduce CO2? **Veterans Day No Classes** What are C3, C4, CAM pathways? **Q10**	8 8	**VETERANS DAY NO LAB**
13	Nov16 Nov18 Nov20		What is the cell cycle? **Exam 3 (lab and lecture)** Furlough	ch9 p180-192	DNA recovery, gel
14	**Nov23** **Nov25** **Nov27**		**Thanksgiving** **Vacation** **No Classes**		**THANKSGIVNG NO LAB**
15	Nov30 Dec2 Dec4	VI Cell Cycle and Inheritance	What is cancer? What is sexual reproduction? How are alleles recombined? **Q11**	ch17 p386-390 ch9 p193-195 ch9 p195-205	TT-PCR, cloning **1st Rnd gel figs text**
16	Dec7 Dec9 Dec11		Can I predict gametes for an individual? Determining geno- and phenotypes. Review for Final **SURVEY**	10 10	TT-PCR gel, screen **Group paper final** **Nbook II**
17	Dec 18		**Final lec / lab Exam is Friday 12-2pm**		

Student Learning Objectives: Upon completion of Biology 151 students should be able to:

1. Define the steps of the scientific method; carry out simple laboratory investigations complete with collection of numerical data, calculation of rates, presentation of data, and the use of the student's t-test to reach a conclusion; read a scientific paper and identify observations, question, hypotheses, variables, methods, results, conclusions, and interpret figures and graphs.

2. Use water, sodium chloride, and carbon containing molecules as examples to discuss/explain the octet rule, covalent bonds, hydrogen bonds, hydration, ionic bonds, specific heat, pH; explain why liquid water is important for life.

3. Describe hypotheses on the origins of the biologically important macromolecules on earth; describe their subunit structure; identify/draw nucleic acids, amino acids, carbohydrates, lipids; recognize specific functional groups within each molecule type.

4. Describe energy changes and events in enzyme catalyzed reactions; explain saturation kinetics; explain coupling, oxidation-reduction reactions; define oxidation, reduction, acid, base; recognize reduced compounds.

5. List the properties of life, and describe hypotheses of events on earth leading to the first living systems and ultimately cells.

6. Diagram a replication fork, provide descriptions or functions for the structures and enzymes involved; explain how simultaneous replication of antiparallel strands proceeds in one direction; describe proofreading and repair processes.

7. Diagram typical prokaryote and eukaryote cells; label their components; indicate the macromolecular composition of each component; describe the biochemistry/ function along with any major molecular traffic to and from each component.

8. Describe mechanisms of transport across biological membranes; identify from description or experimental results passive and active forms of membrane transport; describe differences and similarities among, channels, carriers, pumps; explain saturation kinetics.

9. Explain osmosis and make predictions on the direction of water movement for cells when given internal and external solute concentrations.

10. Describe the extracellular matrix for prokaryote and eukaryote cells; list, describe, and provide functions for the cell-to-cell connections/junctions of animals and plants.

11. List and describe signal transduction through at least two basic types of signal transduction pathways; name and describe the action of secondary messengers during signal transduction; describe at least two different outcomes of signal transduction that allows cells to change their internal conditions.

12. Summarize events in central metabolism; diagram and label within the appropriate compartments of a cell the central/intermediary metabolic pathways including names of pathways, substrates into and out of each pathway, sites of ATP, NADH synthesis or use, and key regulatory points.

13. Summarize the light dependent reactions and the Calvin cycle of photosynthesis; provide descriptions and locations for the basic machinery; describe the catalytic capabilities of Rubisco, the consequences of this activity in an oxygen rich environment; summarize and compare C3, C4, and CAM photosynthesis.

14. Describe events in all phases of the cell cycle; describe molecular events controlling the cell cycle; explain the roles of tumor suppressors, and proto-oncogenes in the cell cycle and events that might lead to cancer.

15. Compare and contrast mitotic versus meiotic nuclear divisions; accurately draw chromosomes during steps of these divisions to display understanding of synapsis, cross over, recombination, and independent assortment.

16. Define allele; provide an explanation for dominance; predict the gametes from a given individual; make predictions of genotypic and phenotypic ratios for matings; complete a Punnet square or forked-line diagram, analyze their results through comparison to their prediction, and reach a conclusion on the mechanism of inheritance.

17. Diagram/transcribe-translate a prokaryotic or eukayotic gene, labeling and defining functions for each component of the gene required for expression and targeting.

18. List and describe different levels of gene regulation in terms of efficiency and response time; define and describe the roles of silencers, enhancers, repressors, activators in transcriptional regulation; make predictions on expression of the *lac operon* when given the identity of any mutations to the operon and the identity of substrates available to the cell.

19. List and provide detailed descriptions for numerous differences between prokaryote and eukaryote cells with respect to cell structure, metabolism, and gene expression.