Course Information

BioSc 147 – Molecular and Cellular Biology - 4 units — Fall 2017, Section 1361
Contra Costa College — Katherine Krolikowski

Lecture: Monday and Wednesday (Room B-7, 9:40AM-11:00 AM).
Lab: Friday (Room B-18, B-22. 9:40AM-12:30PM)
Contact: Katie Krolikowski Office: B-4, Phone: (510) 215-3990 , Email: kkrolikowski@contracosta.edu
Webpage: Some course materials will also be made available at the course web page:
Go to: http://www.cccbiotechnology.com
Canvas: You will be sharing pre-labs with your lab partner and assessing each others' work using Canvas. Basic proficiency with this online tool and daily access to a compatible computer is required.
Office Hours: Room B-4, My Office. M(11AM-1PM), W (11-11:30AM, **Biotech lab** 3-4PM), Th 12:30-2PM)
Required Materials: *Life. The Science of Biology* (11th ed) Sadava, Hills, Heller, Berenbaum. *Lab Manual for BIOSC147* (3rd ed) Katherine Krolikowski); *Email account and web access*
Pre Requisites: CHEM 120 (may be taken concurrently), MATH 120, and either BIOSC106 or BIOSC172L. You must be eligible for ENGL 1A.
Evaluations:

In-class discussions of current literature related to the previous weeks topic occur at the very beginning of Tuesday lectures as listed in the course schedule.
12 discussions at 10 points each = 120 points
Pre-labs are due the class meeting before each week's lab, as listed in the course schedule
12 pre-labs at 15 points each = 180 points
Lab notebook entries and reports are due as listed in the course schedule.
6 entries and/or reports at 50 points each = 300 points
Exams and/or projects occur during class time or are due as listed in the Course Schedule.
4 exams at 100 points each = 400 points
Total for course = 1000 points
A: 90-100%, **B:** 79-89%, **C:** 67-78%, **D:** 55-66%, **F:** below 55%
Extra credit opportunities may be offered for a total of not more than 60 points.

Attendance: Attendance at lectures is very important, as this is your opportunity to be guided through important material, and ask questions. In addition, material for the lab will be covered, pre-labs will be due, and lectures are also the time for discussions. I strongly suggest that students read and take notes on relevant materials in the texts and lab book BEFORE the lecture for maximum impact. Attendance at labs is mandatory. Labs cannot be made up.

Course Description and Objective: This course, intended for majors, will cover principles and applications of prokaryotic and eukaryotic cell structure and function, biological molecules, homeostasis, cell reproduction and its controls, molecular genetics, classical/Mendelian genetics, cell metabolism including photosynthesis and respiration, and cellular communication. The philosophy of science, methods of scientific inquiry and experimental design are foundational to the course. In the laboratory portion of the course, students will apply techniques and experimental skills commonly used in biotechnology and molecular biology laboratories.

At the completion of the course the student will be able to: Identify and describe biological molecules and cell structures and explain their functions; Compare and contrast cellular processes and interactions between prokaryotes and eukaryotes (including metabolism, reproduction, communication). Identify and define the structure, function, and organismal distribution of carbohydrates, lipids, proteins, and nucleic acids. Discuss the roles of ATP and NADH in cellular energetics. Define and interpret the overall equation for cellular respiration. Discuss the events of glycolysis, the citric acid cycle, and

electron transport, and the use of a proton gradient to generate ATP within mitochondria. Evaluate the yield of ATP molecules in respiration. Explain the process of fermentation in various prokaryotic and eukaryotic cells. Compare and contrast fermentation process and ATP yield with cellular respiration. Define and interpret the overall equation for photosynthesis. Discuss, compare, and contrast the molecular events of the light and dark reactions. Discuss the functional anatomy of leaves and chloroplasts and their involvement in photosynthesis. Identify, explain, and interpret the distribution, structure, and function of organelles in eukaryotic cells. Compare and contrast the structure and functions of prokaryotic and eukaryotic cells. Discuss the origin of prokaryotic and eukaryotic cells. Define and give examples of tissues, organs, and organ systems in animals and plants. Explain, discuss, and interpret cell-signaling systems. Explain, discuss and interpret the structure and functions of various hormones and endocrine glands in invertebrates and vertebrates. Explain how these process are involved in organismal homeostasis. Define, interpret, and provide examples of the various kinds of passive and active transport occurs in cells. List, evaluate, and discuss the biochemistry and mode of operation of hormones and other regulatory substances, and environmental factors influencing the growth of plants. Describe and discuss those factors determining and affecting the growth rate of populations.

Apply the principles of classical and molecular genetics to solve problems in genetics and biotechnology; Explain how DNA replicates and transmits genetic information within organisms. Define, explain, and interpret the basic vocabulary of genetics. Analyze and solve basics problems in Mendelian genetics. Analyze and solve problems involving non-Mendelian genetics. Define and explain mutations, and their molecular and cellular consequences. Explain recent advances in genetic engineering and biotechnology involving the introduction of new or modified genetic material into the organismal genome and the cloning of organisms. Analyze proteins using chromatography, SDS-PAGE, and ELISA technologies. Determine protein concentration with a microtiter plate format assay. Analyze DNA molecules using the polymerase chain reaction and agarose gel electrophoresis, determine the relative sizes of DNA molecules using standards. Discuss the process of cellular reproduction in prokaryotic and eukaryotic cells. Identify, explain, and interpret the events and sub-divisions of mitosis and cytokinesis in both animal and plant cells. Compare and contrast mitosis with meiosis; identify, explain, and interpret the events and sub-divisions of meiosis. Explain, interpret, and discuss the structure and function of DNA. Discuss the process of DNA replication. Explain, interpret, and discuss the encoding of genetic information in DNA, and how this is later expressed in transcription and translation. Construct the flow diagram of gene expression from DNA to protein. Compare and contrast DNA replication and gene expression in prokaryotic and eukaryotic cells. Evaluate the timing of these events in the cell cycle. Explain and interpret those factors regulating the expression of genes in prokaryotic and eukaryotic cells. Discuss the general structure and function of viruses. Compare and contrast the lytic and lysogenic cycles of viruses.

Relate evolutionary processes to the origin and evolution of cells. Define, explain, and interpret evolution and natural selection. Explain how our understanding of natural selection and evolution is applied in Biotechnology and Molecular Biology

Apply the processes of scientific inquiry and experimental design to the study of biological concepts; Acquire, read, evaluate, apply and cite scientific literature; Practice scientific writing. Use laboratory investigations and appropriate procedures to generate accurate and meaningful data and derive reasonable conclusions from them. Understand, analyze and interpret scientific articles. Connect ideas discovered in scientific articles to a broader context, including other scientists' ideas. Present laboratory findings using the format of scientific writing. Include a clear thesis synthesizing ideas from both new data and a variety of sources Organize ideas logically and effectively according to the standard scientific paper format. Properly cite papers used in background and analysis sections.

Student Learning Outcomes: Demonstrate knowledge of the structure and function of the 4 groups of organic molecules occurring in living organisms. Demonstrate knowledge of the structure and function of organelles occurring in cells. Demonstrate knowledge of differences between anabolic and catabolic energy metabolism in cells. Demonstrate knowledge of the inheritance and expression of alleles in different patterns of inheritance. Demonstrate knowledge of the structure of DNA and its expression in protein synthesis. Accurately set up reaction mixes. Correctly perform calculations for and prepare buffers.

General Notes: Lab write-ups, reports and other assignments are to be your own work. Discussion of the material in groups is encouraged, but it is absolutely required that the work turned in is entirely your own. Violation of this policy is grounds for loss of credit on assignments, and severe or repeated violations are cause for disciplinary action as described in the CCC Student Code of Conduct/Academic Honesty Policy/Student Handbook. Spelling, grammar, writing style and attention to the format of the exercise are important. It is expected that you adhere to the classroom rules, described on a separate handout

DSPS Statement : Students who would like to receive accommodations for their learning, physical, or psychological disabilities should contact the Disabled Students Programs & Services (DSPS) office (H-19) and schedule an appointment. (510) 215-3969."

A Covenant between the student and the professor for BIOSC 147

I, _____, the student, acknowledge the following:

- **The study of science is challenging, and preparation and attention are essential.**
  I realize that when I miss class, I miss a valuable experience. It is up to me to reach out and communicate with others to do my best to gather missed information. I will do everything I can to NOT miss any class time.
- **Life moves on, with or without me.**
  The time in the biology lab is limited and a unique opportunity. When I am prepared before lab, I will gain the most from my lab experience. If I arrive at lab un-prepared, I will be using this special time and space and to do something I could have done in any number of places. I will spend time before lab each week to get prepared for this incredible experience.
- **My teammates depend on me.**
  Teamwork is very important in this class. When I am missing, or not focused on the present moment, I not only detract from my own experience, but from that of my lab-mates. I will make every effort to be a good teammate. I will acknowledge the times I am distracted or disruptive, and try my best to communicate clearly with my colleagues.
- **The instructor has valuable information to share with me**
  My professor is a trained professional, and her job is to create an effective learning environment for me and for my classmates. I realize that every person has different ways of communicating and different strengths, and that my professor tries hard to help every student in the class grow as much as possible. I will use my time in this course to work with my professor and wholeheartedly participate in this particular learning environment.

I, _____, the professor, acknowledge the following:

- **Being a science major is likely a new experience for students**
  While my professional life has been devoted to scientific work, I understand that this is not (yet) true of most students. I will make every effort to listen to and address the ideas and perspectives that students share in class.
- **The best way to prepare for a scientific experience is not obvious to many students**
  I have had a lot of experience in being prepared for a scientific experience, and it feels second-nature to me. I realize that I sometimes become frustrated when I feel students are un-prepared for class. I will do my best to assist students with tools, examples, and patience to make it as clear as possible what "being prepared" looks like.
- **Teamwork takes time to develop**
  I realize that students are not only learning a new discipline, science – but that they are also negotiating a complex interaction with their team-mates. I will make every effort to provide constructive observations and assistance with negotiations, when I notice "dysfunction" in a team, rather than scold or criticize students.
- **I have a duty to provide clear and complete information**
  I fully accept my responsibility as an instructor to create an effective learning environment. I commit to arriving to class prepared with lectures, handouts, and graded assignments/feedback for students. I will do my best to address each student's individual learning style. Students' time is valuable, and I will make every effort to be sure that each moment in our classroom is as rich as possible.

I have read and acknowledge the covenant "**A Covenant between the student and the professor for BIOSC147",** which is attached to my copy of the BIOSC147 syllabus. I agree to follow this covenant throughout the semester.

Signed:

_____, Instructor Date: _____

_____, Student Date: _____

Here is how I've met the CHEM120 and MATH 120 pre-requisite requirement:

Semester I took CHEM 120 at CCC _____

Other school if not CCC: _____

Instructor I had for CHEM 120 _____