SYLLABUS

DATE OF LAST REVIEW: 02/2013
CIP CODE: 24.0101
SEMESTER: Departmental Syllabus
COURSE TITLE: Principles of Cell and Molecular Biology
COURSE NUMBER: BIOL-0135
CREDIT HOURS: 4
INSTRUCTOR: Departmental Syllabus
OFFICE LOCATION: Departmental Syllabus
OFFICE HOURS: Departmental Syllabus
TELEPHONE: Departmental Syllabus
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KCKCC-issued email accounts are the official means for electronically communicating with our students.

PREREQUISITE(S): NONE

REQUIRED TEXT AND MATERIALS: Please check with the KCKCC bookstore, http://www.kckccbookstore.com/, for the required texts for your particular class.

COURSE DESCRIPTION:
This is an integrated lecture and laboratory course for biology majors and students planning to take additional courses in biology. This class introduces the fundamental biological principles characteristic of all living things. Since the cell is the basic unit of life, this course will focus on life at the cellular and molecular levels. Subjects covered include basic biochemistry, cell anatomy and physiology, bioenergetics, genetics and evolution. Emphasis will be placed on learning the process skills and equipment associated with being a biologist.

METHOD OF INSTRUCTION: A variety of instructional methods may be used depending on content area. These include but are not limited to: lecture, multimedia, cooperative/collaborative learning, labs and demonstrations, projects and presentations, speeches, debates, and panels, conferencing, performances, and learning experiences outside the classroom. Methodology will be selected to best meet student needs.

COURSE OUTLINE
I. Chemistry of life
   A. Biochemical molecules
   B. Basic biochemical reactions
   C. Enzymes
II. Cellular organization  
   A. Prokaryotes and eukaryotes  
   B. Cell organelle function  
   C. Movement of materials into and out of cells  

III. Bioenergetics  
   A. ATP  
   B. Photosynthesis  
   C. Aerobic respiration and fermentation  

IV. Reproduction and the continuity of life  
   A. Asexual and sexual reproduction  
   B. Mitosis and meiosis  
   C. Reproduction and development  

V. The principles of genetics  
   A. Mendelian genetics  
   B. DNA replication  
   C. Protein synthesis  
   D. Mutation  
   E. Molecular genetics  

VI. Evolution: the mechanism of change in biology  
   A. Genetic basis of evolution  
   B. Natural selection  
   C. Speciation  

VII. Principles of cell physiology  
   A. Neurons and synapses  
   B. Muscular contraction  
   C. Hormones  
   D. Antibodies  
   E. Movement through xylem and phloem  

VIII. The materials and methods of science  
   A. Construct hypotheses  
   B. Perform experiments using scientific equipment  
   C. Analyze results  

EXPECTED STUDENT OUTCOMES:  
A. The student will be able to explain basic chemical functions as they apply to biology.  
B. The student will be able to identify cellular structures and explain their functions.  
C. The student will be able to describe the basic principles of bioenergetics.  
D. The student will be able to explain the different types of cell division.  
E. The student will be able to discuss the basic principles of Mendelian and molecular genetics.  
F. The student will be able to describe the interaction of genetics, natural selection and evolution.  
G. The student will be able to explain the basic principles of cellular physiology.  
H. The student will be able to correctly use the materials and apply the methods of science in a laboratory setting.
COURSE COMPETENCIES:

The student will be able to explain basic chemical functions as they apply to biology.
1. The student will be able to describe the basic structure of an atom.
2. The student will be able to explain that electrons determine how atoms interact.
3. The student will be able to describe ionic, covalent, and hydrogen bonds.
4. The student will be able to describe the four major classes of organic molecules used by cells, their functions, and their building blocks.
5. The student will be able to explain how an enzyme operates.

The student will be able to identify cellular structures and explain their functions.
6. The student will be able to describe the basic tenants of modern cell theory.
7. The student will be able to explain why it is necessary for cells to be small.
8. The student will be able to describe the structure and function of the cell wall, plasma membrane and cytoskeleton.
9. The student will be able to differentiate between prokaryotic cells, eukaryotic cells and viruses.
10. The student will be able to name and explain the functions of the cell nucleus and cytoplasmic organelles.
11. The student will be able to differentiate among the processes of diffusion, osmosis and active transport.

The student will be able to describe the basic principles of bioenergetics.
12. The student will be able to define energy and the laws of thermodynamics.
13. The student will be able to explain the role of ATP in cell processes.
14. The student will be able to describe the light-dependent and light-independent reactions of photosynthesis.
15. The student will be able to describe glycolysis, the Krebs cycle and the electron transport chain and how they are interrelated.
16. The student will be able to explain where the stages of cellular respiration occur and the energy yield of each.
17. The student will be able to describe what happens in a cell to the products of glycolysis when no oxygen is present.

The student will be able to explain the different types of cell division.
18. The student will be able to explain how prokaryotic binary fission occurs.
19. The student will be able to describe what happens during each stage of the cell cycle.
20. The student will be able to list the phases of mitosis and meiosis.
21. The student will be able to compare the results of mitosis and meiosis.
22. The student will be able distinguish between asexual and sexual reproduction.
23. The student will be able describe reproduction and development in plants and animals.

The student will be able to discuss the basic principles of Mendelian and molecular genetics.
24. The student will be able to explain the Mendelian principles of heredity.
25. The student will be able to relate the steps of meiosis to the Mendelian principles of heredity.
26. The student will be able to describe various inheritance patterns, such as epistasis, pleiotropy, multiple alleles, incomplete dominance, codominance and X-linkage.
27. The student will be able to outline the steps of DNA.
28. The student will be able to describe how mRNA is formed from the transcription of DNA.
29. The student will be able to explain the steps of translation, including the roles of ribosomes and tRNA.
30. The student will be able to describe the mechanisms that cause mutations.
31. The student will be able to explain how genes are regulated in eukaryotes and prokaryotes.
32. The student will be able to explain some of the basic procedures used in genetic engineering.

The student will be able to describe the interaction of genetics, natural selection and evolution.

33. The student will be able to explain the genetic basis of evolution.
34. The student will be able to describe the process of natural selection.
35. The student will be able to discuss methods of speciation.

The student will be able to explain the basic principles of cellular physiology.

36. The student will be able to explain how nerve impulses are generated and transmitted.
37. The student will be able to explain how hormones travel through the human body and how they are recognized by target cells.
38. The student will be able to describe the sliding filament theory of muscle contraction.
39. The student will be able to explain the functions of antibodies.
40. The student will be able to describe the cohesion-tension theory and the pressure-flow hypothesis for plants.

The student will be able to correctly use the materials and apply the methods of science in a laboratory setting.

41. The student will be able to construct testable hypotheses and perform experiments.
42. The student will be able to analyze experimental results.
43. The student will be able to demonstrate proper use of scientific equipment.

ASSESSMENT OF STUDENT OUTCOMES MAY INCLUDE, BUT ARE NOT LIMITED TO THE FOLLOWING:
Student progress is evaluated by means that include, but are not limited to, exams, written assignments and class participation.

SPECIAL NOTES:
This syllabus is subject to change at the discretion of the instructor. Material included is intended to provide an outline of the course and rules that the instructor will adhere to in evaluating the student’s progress. However, this syllabus is not intended to be a legal contract. Questions regarding the syllabus are welcome any time.

Kansas City Kansas Community College is committed to an appreciation of diversity with respect for the differences among the diverse groups comprising our students, faculty, and staff.
that is free of bigotry and discrimination. Kansas City Kansas Community College is committed
to providing a multicultural education and environment that reflects and respects diversity and
that seeks to increase understanding.

Kansas City Kansas Community College offers equal educational opportunity to all students as
well as serving as an equal opportunity employer for all personnel. Various laws, including Title
IX of the Educational Amendments of 1972, require the college’s policy on non-discrimination
be administered without regard to race, color, age, sex, religion, national origin, physical
handicap, or veteran status and that such policy be made known.

Kansas City Kansas Community College complies with the Americans with Disabilities Act. If
you need accommodations due to a documented disability, please contact the Director of the
Academic Resource Center, Rm. 3354 or call: 288-7670.