

General Biology I (w/Lab) Syllabus

BIO K121 Four Credit Course

CRN: 31148

BIO K121 (T6)

CRN: 31149 (T6A)

Fall 2012

Three Rivers Community College

Norwich, CT 06360

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Office Hrs.

T & R 2:00-3:00 pm; F 12:30-1:30

Or by appointment

Required Text:

Russell. 2011. Biology: The Dynamic Science Volume 1, 2nd ed. Cengage Learning Publishing. ISBN:9781133444817

Catalog Description:

Prerequisite: High school chemistry or CHE K111 or higher, either course with a "C" grade or better. Placement score indicating eligibility to take ENG* K101 or ENG* K100 passed with a "C" grade or better. Corequisite: CHE* K111 - if a student has not met the above chemistry prerequisite, the student may take BIO* K121 by concurrently taking CHE* K111.*

This course introduces the major principles and concepts of modern biology. Topics to be covered include molecular and cellular biology, cell division, cellular transport systems, cellular metabolism, the specialization and differentiation of both plant and animal cells, and modern genetics. Three-hour lecture; one three-hour laboratory period.

Primary Objectives:

In addition to developing an understanding of the biological sciences as it relates to other scientific disciplines, the student will be aided to contrive an awareness of the interdependence of all life forms on natural laws that ensure their own stability. An understanding of life processes and the interrelationship between humans and other life forms will be developed.

Attendance Policy:

Students are expected to attend class and laboratory sessions regularly. If a class or lab is missed due to circumstances beyond your control, **please**, be sure to notify your instructor and make the necessary arrangements for obtaining the lecture notes. **You will be responsible** for the material. **If 3-4 classes (and/or 3-4 labs) are missed, a deduction of 5 POINTS will be taking from your final grade. TEN POINTS will be deducted from your final grade if 5 or more classes (and/or labs) are missed.**

****Final Exam exemption**** If you score a 95/100 on two Exams/Practicum's and 90/100 on all other exams/practicum's, and hand in a formal lab report (for a re-write), you would be exempt from taking the Cumulative Final Exam.

Grade Evaluation*[Ⓢ]:

There will be three unit examinations: **09/27, 10/31, and 12/13** (tentatively), two laboratory practicals **10/10** and **12/25**. There will be twelve quizzes. The lowest 2 quiz grades[Ⓢ] will be dropped. A **cumulative** final exam will be administered on **12/19**. Exam and quiz questions will consist of multiple choice and/or short answers.

Add/Drop Procedures:

Please consult the school catalog for this policy.

Suggestions for the course:

To gain a better understanding be sure to read the required reading sections **before** coming to class. Also, be prepared to participate in classroom discussions.

Grading:

Final grade will based on the following:

Semester Grade*	-----50%
Laboratory Grade [£]	-----40%
Final Examination	-----10%
	100%

*Semester grade = 40% Unit tests + 10% quizzes

[£]Laboratory grade = 20% Lab practicums + 10% Lab Summaries + 10% Formal Lab Report

Final Grade:

100.0-99.0= A	79.4-77.5= C+
98.9-93.5= A	77.4-72.5= C
93.4-90.5= A-	72.4-69.5= C-
90.4-87.5= B+	69.4-63.5= D+
87.4-84.5= B	63.4-59.5= D
84.4-79.5= B-	59.4-00.0= F

College Withdrawal Policy:

A student who finds it necessary to discontinue a course once class has met must provide written notice to the registrar. A "W" grade on their academic record, non-punitive grade indicating termination of class participation. Students who do not withdraw, but stop attending **will receive** a grade of "F" for the final grade. **Verbal withdrawals cannot be accepted by the Instructor.**

Disabilities Statement:

If you have a hidden or visible disability that may require classroom or test-taking modifications, please see me as soon as possible.

Academic and Classroom Misconduct:

The instructor has the primary responsibility for control over classroom behavior and maintenance of academic integrity, and can order the temporary removal or exclusion from the classroom, and/or laboratory, of any student engaged in conduct violative of the general rules and regulation of the institution. Plagiarism, cheating, or any form of academic dishonesty is **prohibited**. Students guilty of academic dishonesty directly or indirectly will receive a **zero** for an exercise or exam and may receive an **F** for the course in addition to other possible disciplinary sanctions that maybe imposed through the regular institutional procedures. Any student that believes he or she has been erroneously accused may appeal the case through the appropriate institutional procedures if their grade was affected.

BIO K121 General Biology I w/Lab**Tentative Schedule**

Fall 2012

Lecture: 3:25pm-4:50pm T/R Room: D-210**Laboratory: 3:00pm-6:00pm W Room: A-215**

Date	Topic	Chapter # in Campbell et al.
08/28	Orientation/Scientific method	
08/29	LAB 1 (The scientific method)	
08/30	Characteristics of Life	1
09/04	Organization of life - Quiz 1	2 & 3
09/05	LAB 2 (Introduction to the microscope)	
09/06	Chemistry and life	4
09/11	Bio-organic molecules - Quiz 2	5
09/12	LAB 3 (Chemistry)	
09/13	The cell- Structures and functions	6
09/18	Plasma membranes - structure and function - Quiz 3	7
09/19	LAB 4 (The structures of the cell/Models and microscope study)	
09/20	Cell division	12
09/25	mitosis - Quiz 4	13
09/26	LAB 5 (Diffusion and osmosis)	
09/27	UNIT EXAM I	40
10/02	meiosis	
10/03	LAB 6 (Mitosis/meiosis)	12 & 13
10/04	Animal tissue /function Quiz 5	35
10/09	Plant tissue/function (cont.)	36
10/10	LAB PRACTICAL I	
10/11	Cellular metabolism - Quiz 6	8 & 9
10/16	Photosynthesis - Quiz 7	10
10/17	LAB 7 (Animal tissues)	
10/22	Fermentation/C ₄ and CAM plants	
10/23	Photosynthesis (cont.)- Quiz 8	10
10/24	LAB 8 (Plant tissues)	
10/30	Exam II review	
10/31	UNIT EXAM II	
11/01	LAB 9 (Photosynthesis)	
11/02	Inheritance - Quiz 9	14
11/06	Mono- & di- hybrid crosses	
11/07	LAB 10 (enzymes)	
11/08	Inheritance - Quiz 10	16
11/13	Inheritance (cont.)	
11/14	LAB 11 (Forensic DNA)	
11/15	Molecular Genetics - Quiz 11	12,13
11/22	Transcription/Translation	17
11/23	LAB 12 (Dragon Genetics)	18
11/24	NO CLASSES - Thanksgiving	
11/29	DNA Replication	
12/05	LAB PRACTICAL II	
12/06	Genetic engineering	
12/11	Gene expression - Quiz 12	
12/12	Review for Exam III	
12/13	Exam III	
12/18	Review for Final	
12/19	FINAL EXAM	

Syllabus Revisions:

This schedule may be subject to change as the instructor sees fit.

Detailed Course Objectives - BIO K121:

- 1) The student will develop 'critical thinking skills' through the analysis of scientific data.
- 2) The student will be able to describe the scientific methods through examples.
- 3) The student will be able to list and describe the characteristics of life shared by all living organisms.
- 4) The student will be able to identify the principle elements that make up living organisms, give their symbols and their biological importance.
- 5) The student will demonstrate knowledge of ionic, covalent, and hydrogen bonding.
- 6) The student will be able to list the types of organic and inorganic compounds common to all living organisms and describe the biological importance of each.
- 7) The student will be able to define pH in terms of the concentration of hydrogen ions and be able to identify any given pH as acid, base, or neutral.
- 8) The student will be able to describe how pH changes are minimized by buffers.
- 9) The student will demonstrate knowledge of the cell history.
- 10) The student will be able to list the various organelles in a typical animal cell and a typical plant cell and explain the function of each organelle.
- 11) The student will be able to explain the difference between plant and animal cells.
- 12) The student will be able to list and explain the major differences between prokaryotic and eukaryotic cells.
- 13) The student will demonstrate knowledge of the various mechanisms of passive and active transport systems related to the cell membrane.
- 14) The student will demonstrate knowledge of the processes of cell division (mitosis and meiosis).
- 15) The student will demonstrate knowledge of the major classes of plant and animal tissues, list the types of tissues in each class and describe their function.
- 16) The student will be able to define energy and state the laws of energy conservation.
- 17) The student will be able to explain the photosynthesis process.
- 18) The student will be able to define the term metabolism and explain the difference between anabolic and catabolic metabolism.

Detailed Course Objectives (cont.)

- 19)** The student will be able to define the term enzyme, list the principle properties of enzymes, and describe enzymatic action.
- 20)** The student will to demonstrate knowledge of chemical energy in cells and the cellular respiratory process.
- 21)** The student will be able to explain the role of chromosomes and genes in inheritance and describe how they are passed from one generation to the next.
- 22)** The student will be able to understand the relationship between meiosis.
- 23)** The student will demonstrate knowledge of the Mendelian Laws of genetics.
- 24)** The student will demonstrate knowledge of the various forms of gene interactions.
- 25)** The student will be able to discuss some common forms of human genetic diseases.
- 26)** The student will demonstrate knowledge of modern genetic concepts and molecular genetics (the role of DNA & RNA).
- 27)** The student will be able to explain the process of protein synthesis.

Detailed Course Outline - BIO K121

Unit 1

I Introduction

- A)** Early history and development of biology as a science
 - 1.** Biology as a science
 - 2.** The scientific method
- B)** The characteristics of life
 - 1.** Level of organization
 - 2.** Irritability (response to stimuli)
 - 3.** Adaptability
 - 4.** Growth
 - 5.** Movement
 - 6.** Metabolism
 - 7.** Reproduction

II The chemistry of life

- A)** Matter
 - 1.** Composition
 - 2.** Forms
 - a)** solids
 - b)** liquids
 - c)** gases

Detailed Course Outline – BIO K121 (cont.)

- 3.** Elements common to all living organisms
 - a)** carbon
 - b)** nitrogen
 - c)** oxygen
 - d)** phosphorus
 - e)** hydrogen
 - f)** sulfur
 - g)** calcium
 - h)** sodium
 - i)** chlorine
 - j)** iron
 - k)** magnesium + other trace elements

- B)** How the elements differ
 - 1.** The atom and it's structure
 - a)** protons
 - b)** electrons
 - c)** neutrons
 - 2.** Atomic numbers
 - 3.** Atomic masses (weights)
 - 4.** Isotopes

- C)** Electron arrangement and energy levels

- D)** Electron arrangement versus reactivity
 - 1.** Chemical bonding
 - a)** ions and ionic bonding
 - b)** covalent bonding
 - 1)** polar
 - 2)** non-polar
 - c)** hydrogen bonding
 - 2.** Molecules

- E)** Inorganic compounds important to living organisms
 - 1.** Acids
 - 2.** Bases
 - 3.** Salts
 - 3.** Water

- F)** Organic compounds important to living organisms
 - 1.** Vitamins
 - 2.** Carbohydrates
 - 3.** Lipids
 - 4.** Proteins
 - 5.** Nucleic acids

III Cells

- A)** The cell theory
- B)** Cytoplasmic organelles (structure and function)
 - 1. Endoplasmic reticulum
 - 2. Golgi complex
 - 3. Mitochondria
 - 4. Lysosomes
 - 5. Ribosomes
 - 6. Centrioles
 - 7. Plastids (Chloroplast)

- C)** The cell nucleus

- D)** Appendages of the cell
 - 1. Flagella
 - 2. Cilia

- E)** The differences between plant and animal cells

- F)** The differences between prokaryotic and eukaryotic cells

- G)** The cell membrane
 - 1. Composition
 - 2. Membrane transport mechanisms
 - a) diffusion
 - b) osmosis
 - c) dialysis
 - 2. Membrane transport mechanisms (cont.)
 - d) facilitated diffusion
 - e) active transport
 - f) endocytosis
 - 1) phagocytosis
 - 2) pinocytosis
 - g) exocytosis
 - h) filtration

IV Cellular reproduction

- A)** The cell's cycle of growth
 - 1. Interphase
 - a) growth phase 1 or gap 1 phase
 - b) synthesis phase or s phase
 - c) growth phase 2 or gap 2 phase
 - 2. Mitosis
 - a) prophase
 - b) metaphase
 - c) anaphase
 - d) telophase

- B) Meiosis**
 - 1.** Reproductive division - Meiosis I
 - a)** prophase I
 - b)** metaphase I
 - c)** anaphase I
 - d)** telophase I
 - 2.** Equational division - Meiosis II
 - a)** prophase II
 - b)** metaphase II
 - c)** anaphase II
 - d)** telophase II
- C) Gametogenesis**
 - 1.** spermatogenesis
 - 2.** oogenesis

Unit II

- I** The differentiation and specialization of cells (Histology)
 - A)** Tissues (defined)
 - B)** Major classes of animal tissues (structure and functions)
 - 1.** Epithelial tissues
 - a)** simple squamous
 - b)** simple cuboidal
 - c)** simple columnar
 - d)** stratified squamous
 - e)** stratified columnar
 - f)** pseudo-stratified ciliated columnar
 - g)** transitional
 - 2.** Connective tissues
 - a)** loose connective
 - 1)** areolar
 - 2)** adipose
 - b)** dense connective
 - 1)** tendons
 - 2)** ligaments
 - 2.** Connective tissues (cont.)
 - c)** special connective
 - 1)** blood
 - 2)** reticular tissue
 - 3)** cartilage
 - 4)** bones
 - 3.** Muscle tissue
 - a)** smooth
 - b)** cardiac
 - c)** skeletal
 - 4.** Nervous tissue
 - a)** neurons
 - b)** neuroglial

- C) Membranes**
 - 1. Serous
 - 2. Mucous
 - 3. Cutaneous
 - 4. Synovial
- D) The major classes of plant tissues (structure and function)**
 - 1. Epidermal tissue
 - a) stoma
 - b) guard cells
 - 2. Vascular tissue
 - a) xylem
 - b) phloem
 - 3. Meristematic tissue
 - a) cambium - cork cells
 - b) apical meristem
 - c) lateral meristem
 - 4. Fundamental tissues
 - a) parenchyma cells
 - b) chlorenchyma cells
 - c) collenchyma cells
 - d) sclerenchyma cells

II Energy transformations

- A) Energy and chemical directions**
 - 1. The first law of thermodynamics
 - 2. The second law of thermodynamics
- B) Cell energy molecule**
 - 1. ATP
- C) Metabolism**
 - 1. Anabolic reactions
 - 2. Catabolic reactions
- D) Enzymes**
 - 1. Chemical properties
 - 2. Action
 - 3. Classification
 - 4. Factors affecting enzymatic activity
- F) Photosynthesis**
 - 1. Essential factors of photosynthesis
 - a) carbon dioxide
 - b) water
 - c) light
 - d) chloroplast - chlorophyll
 - 2. The process of photosynthesis
 - a) the light reaction - photophosphorylation
 - b) the calvin cycle - carbon fixation (dark reaction)
 - c)
- G) Cellular respiration**
 - 1. Glycolysis
 - 2. The Kreb's cycle
 - 3. The electron transport system
- H) Fermentation**

Unit III

I Genetics

- A)** Meiosis and genetics
- B)** Mendal and his work
- C)** Terms
 - 1. Chromosomes
 - 2. Genes
 - 3. Alleles
 - a) homozygous
 - b) heterzygous
 - 4. Genotype
 - 5. Phenotype
 - 6. Dominance
 - 7. Recessiveness
 - 8. Epistasis
 - 9. Parent or P 1 generation
 - 10. First filial or F 1 generation
 - 11. Hybrid
 - 12. Second filial or F 2 generation
 - 13. Incomplete dominance or co-dominance
- D)** The law of segregation
- E)** Monohybrid crosses
- F)** The law of independent assortment
- G)** Dihybrid crosses
 - 1. The punnett square
 - a) genotypical ratios
 - b) phenotypical ratios
 - 2. Probability
- H)** Back crosses
- I)** Test crosses
- J)** Gene interaction
 - 1. Epistasis
 - 2. Complementary genes
 - 3. Supplementary genes
- K)** Quantitative inheritance
 - 1. Multiple alleles
 - 2. Polygenetic inheritance
- L)** Sex linked traits
 - 1. The sex determining chromosomes
 - 2. X - linked genes
 - 3. Y - linked genes
- M)** The Hardy-Weinberg law
- N)** Linkage and chromosome mapping
- O)** Changes in chromosome numbers
 - 1. Aneuploid cells
 - a) monosomic cells
 - b) trisomic cells
 - c) polyploid cells

- P)** Chromosomal abberations
 - 1. Mutations
 - 2. Deletions
 - 3. Duplications
 - 4. Inversion
 - 5. Translocation
- Q)** Genes and diseases
 - 1. Sickle cell anemia
 - 2. Thalassemia
 - 3. Cystic fibrosis
 - 4. Tay-sachs disease
 - 5. PKU
 - 6. Lesch-Nyhans disease
- R)** The role of RNA and DNA in inheritance
 - 1. Protein synthesis
 - a) transcription
 - b) translation
 - 2. The operon theory
 - a) operator gene
 - b) promoter gene
 - c) regulator gene
 - d) structural gene

II Evolution

- A)** Heredity and evolution
 - 1. Historical perspective
 - 2. Evidence of evolution
 - 3. Adaptation and evolution
 - 4. The modern concepts of evolution