

## SYLLABUS- Spring 2016

### BIOLOGY K121: General Biology I (w/Lab) THREE RIVERS COMMUNITY COLLEGE

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Office Hours: 30 minutes after lectures and labs or by appointment

**Spring Semester 2016:** 1/25/2016 - 5/16/2016

**Lecture:** Mon 6:30 PM – 9:30 PM **Rm:** D212

**Lab:** Wed 6:30 PM – 9:30 PM **Rm:** A215

**Credit:** 4 credit hours consisting of 3 hours of lecture and 3 hours of laboratory per week during the semester.

#### Required Text:

Morris, J., Hartl, D., Knoll, A., Lue, R., Berry, A., Biewener, A., Farrell, B., Holbrook, N.M., Pierce, N., Viel, A. 2013. Biology: How Life Works. W.H. Freeman & Co. ISBN-13: 9781464142109.

All students are required to maintain a learning portfolio in Digication that uses the (Three Rivers) College Template

#### Catalog Description:

**BIO\* K121 (formerly BIO K111); 4 Credit Hours; GENERAL BIOLOGY I**

Prerequisites: ENG\* K101 or ENG\* K101S placement or completion of ENG\* K096 with a "C+" grade or better. Corequisites: CHE\* K111 or CHE\* K121, either course with a "C" grade or better.

Please note: if completing CHE\* K111 or CHE\* K121 prior to enrolling in BIO\* K121, a grade of "C" or better is required for registration into this course.

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

#### Primary Learning Outcomes:

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.

#### Add/Drop Procedures:

Please consult the school catalog for this policy. It is the student's responsibility to complete any paperwork in the Registrar's office for withdrawal from the course.

#### Withdrawal Policy:

A student who finds it necessary to discontinue a course once class has met must provide written notice to the registrar. **See Registrar for dates.** After that period, a student wishing to withdraw must obtain written authorization of the instructor to receive 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.**

**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.

**Attendance Policy:**

Attendance will be taken at each lecture and lab session. Students are expected to attend class and laboratory sessions and be on time for each lecture and lab. If absent it is the student's responsibility for obtaining lecture materials. If a class or lab is missed due to circumstances beyond your control, please be sure to notify your instructor.

YOU are responsible for the material.

**If 3 classes (and/or labs) are missed, a deduction of 10 POINTS will be taken from your final grade. For logistic reasons, Labs cannot be made up for any reason.**

**Grading:**

The final grade will be based on the accumulation of points throughout the semester from three tests and a cumulative final exam, weekly quizzes, lab reports and two lab practicals.

- **Weekly quizzes** will be given on the previous week's lecture material.
- **Four unit tests** will be given covering the lecture materials.
- A **cumulative** final exam will be administered during finals' week.
- Weekly **laboratory assignments** are due by the following week.
- **One formal lab report** will be.
- **Three Lab Practicals** will be given.

**Grade Breakdown**

- Weekly Lecture Quizzes- 10%
- Unit Tests – 40%
- Final Exam- 10 %
- Lab Practicals- 20%
- Lab Report -10%
- Weekly Lab Reports- 10%

## WITHOUT EXCEPTION:

- ◆ Students **MUST** be present in lab to earn lab report grades. Labs cannot be made up for logistic reasons. A missed lab report is a 'zero'.
- ◆ Quizzes will be given at the start of lecture. NO MAKE-UPS for missed quizzes under any circumstances. A missed quiz is a 'zero'.

**Table 1.** Percentages of points accumulated by students and the corresponding letter grades.

Letter Grade*	Percentages for Letter Grade	
A	100	94
A-	93.999...	90
B+	89.999...	87
B	86.999...	84
B-	83.999...	80
C+	79.999...	77
C	76.999...	74
C-	73.999...	70
D+	69.999...	67
D	66.999...	64
D-	63.999...	60
F	59.999...	0

\* The instructor reserves the right to use subjective evaluation, especially in cases where the final percentage score is on a borderline between grades.

### **Disabilities Statement:**

If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact the Disabilities Counseling Services. To avoid any delay in the receipt of accommodations, you should contact the counselor as soon as possible. Please note that I cannot provide accommodations based upon disability until I have received an accommodation letter from the Disabilities Counselor. Your cooperation is appreciated.

### **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. Extended or permanent exclusion from classroom, and/or laboratory, or further disciplinary action can be effected only through appropriate college procedure. 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**  
**Spring 2016 Tentative Schedule**

Lecture #	Date	Lecture Topic (Monday)	Textbook Chapter	Exams	Lab (Wednesday)
1	M 1/25	Review Syllabus Introduction Chemistry of Life	1 2		
	W 1/27				Lab safety & Intro to the Scientific Method , Metric Conversions
	M 2/1	Molecules of Life Cell Components	2 5	Quiz 1	
2	W 2/3				Intro to Chemistry and Chemical Composition of cells
3	M 2/8	Cell Components & Transport	5	Quiz 2	
	W 2/10				Membrane Selectivity: Diffusion and Osmosis
4	M 2/15	NO CLASS			
	W 2/17				<b>Lab Practical 1</b>
5	M 2/22	Cell Division	11	Test 1	
	W 2/24				Introduction to the microscope <b>FORMAL LAB REPORT DUE</b>
6	M 2/29	Animal & Plant Tissues Energy	10 6	Quiz 3	
	W 3/2				Microscopic Study of Animal and Plant Cells
7	M 3/7	Cell Metabolism Photosynthesis	7 8	Quiz 4	
	W 3/9				Mitosis/meiosis Specialization and Differentiation of Animal and Plant Tissues
8	M 3/14	DNA, RNA, Transcription		Test 2	
	W 3/16				<b>Lab Practical 2</b>
9	M 3/21	NO CLASS SPRING BREAK			
	W 3/23	NO CLASS SPRING BREAK			
10	M 3/28	DNA, RNA, Transcription continued	4	Quiz 5	
	W 3/30				Photosynthesis

11	M 4/4	Proteins, Translation	12 14	Quiz 6	
	W 4/6				Enzymes
12	M 4/11	DNA Replication Mutations & DNA Repair	15	Test 3	
	W 4/13				DNA
13	M 4/18	Genetic Variation	16	Quiz 7	
	W 4/20				Genetics
14	M 4/25	Mendelian Inheritance	17	Quiz 8	
	W 4/27				Forensics
15	M 5/2	Non-Mendelian Inheritance, Genes and Environment	18	Quiz 9	
	W 5/4				Lab Practical 3
16	M 5/9	Review for Final		Test 4	
	W 5/11				Makeup day if needed
17	M 5/16	<b>Final Cumulative Exam</b>			

### **Syllabus Revisions:**

This schedule is subject to change as the instructor sees fit. The instructor will announce any changes. Snow Days may result in changes.

### **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 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 procaryotic and eucaryotic 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 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.
- 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 mitosis and 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.

**INFORMATION MAY BE PRESENTED IN A DIFFERENT ORDER THAN OUTLINED BELOW****Detailed Course Outline - BIO K121**

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**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
  - 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)** chloroenchyma 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 Krebs's cycle
- 3.** The electron transport system

**H)** Fermentation

**Unit III**

**III** 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-Nyhan 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

**IV** Evolution

**A)** Heredity and evolution

1. Historical perspective
2. Evidence of evolution
3. Adaptation and evolution
4. The modern concepts of evolution