

## General Biology I (w/Lab) Syllabus

**BIO K121 Four Credit Course**

**CRN: 31148**

**BIO K121 (T5)**

**CRN: 31149 (T5A)**

**Fall 2015**

**Three Rivers Community College**

**Norwich, CT 06360**

**Instructor:** Professor William J. Dopirak, Jr

**(860) 215-9424**

**e-mail:** wdopirak@trcc.commnet.edu

**Office Hrs.**

**T - 1:00-3:00 pm; R - 2:00-3:00**

**Or by appointment**

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### **Recommended Text:**

Morris, J. 2013. Biology: How life works MPS (Macmillan Publishers)

ISBN: 9781464142109

### **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\*<sup>Ⓢ</sup>:**

There will be three unit examinations: **10/01, 10/28, and 12/15** (tentatively), two laboratory practicals **10/07** and **12/09**. There will be twelve quizzes. The lowest 2 quiz grades<sup>Ⓢ</sup> will be dropped. A **cumulative** final exam will be administered on **12/17**. 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*	-----60%
Laboratory Grade <sup>£</sup>	-----40%
	100%

\*Semester grade = 45% Unit tests + 10% quizzes +5% final exam

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

**Final Grade:**

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

**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. Please note that accommodations cannot be provided until you provide written authorization from a Disability Service Provider (DSP).

<b>TRCC Disabilities Service Providers</b> Counseling & Advising Office Room A-119	
<b>Matt Liscum</b> (860) 383-5240	<ul style="list-style-type: none"> <li>• Physical Disabilities</li> <li>• Sensory Disabilities</li> <li>• Medical Disabilities</li> <li>• Mental Health Disabilities</li> </ul>
<b>Chris Scarborough</b> (860) 892-5751	<ul style="list-style-type: none"> <li>• Learning Disabilities</li> <li>• ADD/ADHD</li> <li>• Autism Spectrum</li> </ul>

**Digication:**

All students are required to maintain an online learning portfolio in Digication that uses the college template. Through this electronic tool students will have the opportunity to monitor their own growth in college-wide learning. The student will keep his/her learning portfolio and may continue to use the Digication account after graduation. A Three Rivers General Education Assessment Team will select and review random works to improve the college experience for all. Student work reviewed for assessment purposes will not include names and all student work will remain private and anonymous for college improvement purposes. Students will have the ability to integrate learning from the classroom, college, and life in general, which will provide additional learning opportunities. If desired, students will have the option to create multiple portfolios.

**BIO K121 General Biology I****Tentative Schedule**

Fall 2015

**Lecture: 3:25-4:50pm: T & R: Room D-212****Laboratory: 3:00- 6:00pm: W: Room A-215****Suggested readings****in Morris et al.**

<b>Date</b>	<b>Topic</b>	<b>Chapter</b>
09/01	Orientation/The scientific method/	<b>1</b>
09/02	<b>LAB</b> ( <i>Scientific Method</i> )	
09/03	Characteristics of Life – <b>Quiz 1</b>	
09/08	Characteristics of Life (cont.)	<b>2</b>
09/09	<b>LAB</b> ( <i>Introduction to the microscope</i> )	
09/10	Chemistry– <b>Quiz 2</b>	<b>3</b>
09/15	Bio-organic molecules	
09/16	<b>LAB</b> ( <i>Chemistry</i> )	
09/17	The cell - <b>Quiz 3</b>	
09/22	Cellular processes	<b>4</b>
09/23	<b>LAB</b> ( <i>The structures of the cell/Models and microscope study</i> )	
09/24	Plasma membrane and plant cell walls - <b>Quiz 4</b>	
09/29	Cell tonicity	<b>5</b>
09/30	<b>LAB</b> ( <i>Diffusion and osmosis</i> )	
<b>10/01</b>	<b>UNIT EXAM I</b>	
10/06	Cell Division- Mitosis/meiosis	
<b>10/07</b>	<b>LAB PRACTICAL I</b>	
10/08	Cell Division- Mitosis/meiosis (cont.) - <b>Quiz 5</b>	<b>9</b>
10/13	Animal development/tissue	
10/14	<b>LAB</b> ( <i>Mitosis/meiosis</i> )	
10/15	Animal Histology - <b>Quiz 6</b>	<b>31</b>
10/20	Plant histology	
10/21	<b>LAB</b> ( <i>Microscopic study of animal tissues</i> )	
10/22	Plant histology (cont.) & plant structure - <b>Quiz 7</b>	<b>43</b>
10/27	Trophic levels and energy	
10/28	<b>LAB</b> ( <i>Microscopic study of plant tissues</i> )	
10/29	Enzymes/ATP cycle - <b>Quiz 8</b>	<b>6</b>
11/03	Review for exam II	
11/04	<b>LAB</b> ( <i>Enzymes</i> )	
11/05	<b>UNIT EXAM II</b>	
11/10	Photosynthesis	
11/11	<b>LAB</b> ( <i>Photosynthesis</i> )	
11/12	Photosynthesis/Cellular metabolism - <b>Quiz 9</b>	<b>7, 8</b>
11/24	Inheritance	
11/25	<b>LAB</b> (genetics)	
<b>11/26</b>	<b>Thanksgiving recess (no classes)</b>	
12/01	Inheritance (cont.) - <b>Quiz 10</b>	<b>10</b>
12/02	<b>LAB</b> (genetics)	
12/03	DNA replication - <b>Quiz 11</b>	<b>11</b>
12/08	Molecular genetics	
<b>12/09</b>	<b>LAB PRACTICAL II</b>	
12/10	Genetic code– <b>Quiz 12</b>	<b>12</b>
<b>12/15</b>	<b>UNIT EXAM III</b>	
12/16	Review for final exam	
<b>12/17</b>	<b>FINAL EXAM</b>	

**Syllabus Revisions:**

This schedule may be subject to change as the instructor sees fit. The instructor will announce any changes in advance.

### **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**

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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

**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 its 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) ionic 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. Reproductonal 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 cubodial
      - c) simple columnar
      - d) stratified squamous
      - e) stratified columnar
      - f) psuedo-stratified ciliated columnar
      - g) transitional
    - 2. Connective tissues
      - a) loose connective
        - 1) aerolar
        - 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

### **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.

