

General Biology I (w/Lab) Syllabus

BIO K121 (T4), Four sem. hrs. credits **Instructor:** Associate Professor William J. Dopirak, Jr.
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BIO K121 (T4A) **e-mail:** wdopirak@trcc.commnet.edu
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Spring 2012 **Office Hrs. – Location: C-130**
Three Rivers Community College **M –5:00-6pm, R- 2:00-3:00pm**
Norwich, CT 06360 **F Noon -1:00pm (or by appointment)**

Required Text:

Russell et al. 2008. Biology: The Dynamic Science Vol. I; 2nd ed. (Custom edition for Three Rivers Community College). Cengage Learning Publishing. ISBN- 9781133444817

Catalog Description:

An introduction to 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 hours lecture, three hours laboratory. Co-requisite: None required; CHEM 103 or 111 is recommended.

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. The student also will be encouraged to gain intuition about current biological concerns such as: pollution, overpopulation, energy, food production, chemical food additives, and genetic engineering.

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. If 100% attendance is noted, 5 points will be added to your grade.**

Grade Evaluation:

There will be three unit examinations, two laboratory practicals. There will be twelve quizzes. The lowest quiz grade will be dropped. A **cumulative** final exam* will be administered during finals' week. Exam and quiz questions will consist of multiple choice and/or short answers.

***Final exam exemption: >90/100 on ALL three exams, BOTH Lab practical's (2 of which must be >95/100, & re-write**

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%
<u>Final Examination</u>	<u>-----10%</u>
	100%

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

[£]Laboratory grade = 20% Lab practical's + 10% Lab reports + 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. **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.**

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. 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.

Tentative Schedule

Spring 2012

Lecture: 3:30pm-4:55pm T/R: Room: D-212 - Laboratory:3:00pm-6:00pm W Room: A-215

Date	Topic	Chapter # in Russell et al.
01/19	Orientation	
01/24	Characteristics of Life	1
01/25	LAB 1 (The scientific method)	
01/26	Organization of life - Quiz 1	2 & 3
01/31	Chemistry and life	4
02/01	LAB 2 (Introduction to the microscope)	
02/02	NO CLASSES (Faculty Professional Day)	
02/07	Bio-organic molecules - Quiz 2	5
02/08	LAB 3 (Chemistry)	
02/09	The cell- Structures and functions	6
02/14	Plasma membranes - structure and function - Quiz 3	7
02/15	LAB 4 (The structures of the cell/Models and microscope study)	
02/16	Cell division - mitosis	12
02/21	meiosis - Quiz 4	13
02/22	LAB 5 (Diffusion and osmosis)	
02/23	Animal tissue /exam review	40
02/28	UNIT EXAM I	
02/29	LAB 6 (Mitosis/meiosis)	12 & 13
03/01	Plant structure/function Quiz 5	35
03/06	Plant structure/function (cont.)	36
03/07	LAB PRACTICAL I	
03/08	Cellular metabolism - Quiz 6	
03/13	Photosynthesis - Quiz 7	10
03/14	LAB 7 (Animal tissues)	
03/15	Fermentation	
03/20	Photosynthesis (cont.)- Quiz 8	10
03/21	LAB 8 (Animal tissues cont.)	
03/22	Exam II review	
03/27	UNIT EXAM II	
03/28	LAB 9 (Plant tissues)	
03/29	Inheritance - Quiz 9	14
04/03	Mono- & di- hybrid crosses	
04/04	LAB 10 (Photosynthesis)	
04/05	Inheritance - Quiz 10	16
04/10, 04/11, & 04/12	Spring Recess (NO CLASSES)	
04/17	Molecular Genetics - Quiz 11	12,13
04/18	LAB 11 (Photosynthesis)	
04/19	Transcription/Translation	17
04/24	Protein synthesis	
04/25	LAB 12 (Dragon Genetics)	
04/26	Gene expression - Quiz 12	18
05/01	DNA Replication	
05/02	LAB PRACTICAL II	
05/03	Genetic engineering	
05/08	LAB: DNA Electrophoresis	
05/09	UNIT EXAM III	
05/10	Review for Final	
05/15	FINAL EXAM	

Syllabus Revisions:

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

Detailed Learning Outcomes- 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 Learning Outcomes (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 procaryotic and eucaryotic 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)
- G) Cellular respiration**
 - 1. Glycolysis
 - 2. The Krebs's cycle
 - 3. The electron transport system
 - 4. 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