

**Biology 121: General Biology I**  
**Three Rivers Community College, Norwich, CT**  
**Instructor: Karen Culver-Rymsza, Ph.D.**

Office Hours: 30 minutes prior to lecture/lab or by appointment in Adjunct Office

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**Required Text:**

Biology, The Dynamic Science, 2<sup>nd</sup> ed. by Russell, Hertz & McMillan

The study guide is STRONGLY recommended. There is a tremendous amount of material online to help you learn these concepts. You are HIGHLY encouraged to explore resources that support your text as well as those available for other texts. You will find the online animations very helpful.

**Course Prerequisites:**

Current enrollment or passing grade ("C" or better) in English 101 or an equivalent course.

It is strongly recommended that a chemistry course (Chem 101) be completed as well. Knowledge of some basic chemistry is assumed. If you don't have it, you will need to get it on your own.

**Course Description:**

This course stresses the unifying themes in biology including life processes common to all organisms. Topics include scientific method, evolution, chemical basis for life, cell components and processes, cell cycles, molecular genetics and patterns of inheritance. A complete listing of concepts covered is attached. This course meets for three hours of lecture and 3 hours of lab weekly for a total of 4 credit hours.

**Course Objectives:**

To develop an understanding of:

1. The biological sciences as it may be related to other disciplines.
2. Life processes and the interrelationships between man and other living organisms.
3. The dependence of all life forms on natural laws that ensure stability of these life forms.
4. **To provide a useful body of knowledge to students majoring in biology, chemistry or allied health programs.**

**Attendance Policy:**

Attendance of all class activities in lecture and laboratory is expected. Absences are counted from the first meeting of class. More than four consecutive or more than six accumulative absences severely hinders learning and is likely to result in a student failing this course. There is a high degree of correlation between number of absences and probability of failure. If a class or lab is missed due to circumstances beyond your control, be sure to notify your instructor and make the necessary arrangements **with a classmate** for obtaining lecture notes. **You are responsible for all missed material.**

**There will be no scheduled make-up labs for this course.** (see below)

Electronic devices (cell phones, pagers etc.) must be put in "Silent Mode" or turned off during both lecture and laboratory.

**Grade Evaluation:**

There will be 3 unit examinations and 5 quizzes. Lab write ups will be due after completion of each lab, at the next lab session. The lowest quiz grade and lab write-up will be dropped. A **cumulative** final exam will be administered during finals week. Exam and quiz questions will consist of multiple choice, short answers and/or essays. Under no circumstances will tests be returned to

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students. Tests reviewed in class **MUST** be returned or a grade of zero will be recorded and disciplinary action will ensue.

### Grading:

Your final grade will be based on the following:

Semester Grade*	-----55%
Laboratory Grade**	-----25%
Final Examination	-----20%
	100%

\*Semester grade derived from Unit exams (50%)+ Quizzes (5%)

\*\*Laboratory grade = Average of lab **write-ups**.

### Grading System:

100.0-93.5 = A	89.4-86.5 = B+	79.4-76.5 = C+	69.4-66.5 = D+	59.4-00.0 = F
93.4-89.5 = A-	86.4-83.5 = B	76.4-73.5 = C	66.4-59.5 = D	
	83.4-79.5 = B-	73.4-69.5 = C-		

### College Withdrawal Policy:

The last day to withdraw is \_\_\_\_\_. Students who do not withdraw but stop attending **will receive** a grade of "F" for the final grade. **Verbal withdrawals cannot be accepted.**

### Accommodations for Disabilities:

If you need assistance or modification of class procedure owing to any type of disability, please let me know so that arrangements for accommodation can be made. In order to receive accommodations, you must register with Chris Scarborough, learning specialist at 860-823-2985 or a counselor in the Student Services Development Center.

### Academic Misconduct:

Academic dishonesty and plagiarism will not be tolerated. Plagiarism, cheating, or any form of academic dishonesty is **prohibited**. Plagiarism includes any instance of copying words or ideas from another person (i.e. another student, author of a book, internet resource etc.) without properly acknowledging the source. Students guilty of academic dishonesty directly **or indirectly** will receive a **zero** for the exercise or exam and may receive an **F** for the course in addition to other possible disciplinary sanctions that may be imposed through regular institutional procedures.

### Make-ups:

Make-up exams and quizzes will be granted only in the case of a documented emergency and only following a conference with the instructor. Please be aware that the format of any makeup exam is at the discretion of the instructor. In no case will it be the same exam taken at the normal scheduled time. Laboratory participation is expected and required. However, attendance alone will not satisfy the lab grade portion of the course and write ups/packets are required. No credit will be given for a lab write-up if you did not participate in the actual lab and vice versa. Due to scheduling issues individual lab make ups are not feasible. Make ups can be accommodated at the discretion of another instructor in their lab session.

### Syllabus Revisions:

This schedule is subject to change as the instructor sees fit. Any changes will be announced in class

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## **Course Objectives:**

1. The student will be able to describe the requirements of life.
2. The student will be able to describe the characteristics of life shared by living organisms.
3. The student will be able to describe the scientific method through examples.
4. The student will be able to identify the principal elements that make up the body, give their chemical symbols, and summarize the main functions of each.
5. The student will demonstrate knowledge of the atomic structure and its relationship to the interaction of atoms to form molecules.
6. The student will demonstrate knowledge of ionic, covalent and hydrogen bonds and give examples of each.
7. The student will be able to list the types of organic and inorganic compounds found in the living organism and describe their biological importance..
8. The student will be able to define pH in terms of hydrogen ion concentration and be able to identify and given pH as acid, alkaline, or neutral; describe how pH changes are minimized by buffers.
9. The student will be able to demonstrate knowledge of the cell theory and list and explain the major differences between prokaryotic cells and eukaryotic cells.
10. The student will demonstrate knowledge of the cell organelles and their functions.
11. The student will demonstrate knowledge of various mechanisms of active and passive transport relative to the plasma membrane.
12. The student will demonstrate knowledge of mitosis and meiosis.
13. The student will demonstrate knowledge of the classes of tissues and their functions in both plants and animals.
14. The student will be able to define anabolic and catabolic metabolism.
15. The student will be able to define the term enzyme, describe the composition of enzymes, and explain how enzymes are classified.
16. The student will be able to discuss how enzymes are regulated in the cell and the primary action of the various classes of enzymes.
17. The student will be able to explain how chemical energy (ATP) is released by respiratory processes (anaerobic and aerobic).
18. The student will be able to explain the photosynthesis process in terms of cyclic vs. non-cyclic photophosphorylation and the Calvin-Benson cycle.
19. The student will be able to explain the role of genes in inheritance and how they are passed from one generation to the next.
20. The student will demonstrate knowledge of the Mendelian Laws of Genetics.
21. The student will demonstrate knowledge of the various forms of Gene Interaction.
22. The student will be able to discuss some common forms of human genetic disease.
23. The student will be able to explain the role of DNA and RNA in inheritance.
24. The student will be able to discuss special topic in: recombinant DNA technology.

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## Topic Outline:

- I. Life and science
  - A. Life
  - B. Characteristics of life
  - C. The scientific method
  - D. Development of the scientific attitude
  - E. Biology as a science
- II. Chemistry
  - A. Matter and elements
    - 1. the elements common to living organisms
  - B. How elements differ
  - C. Atomic structure
  - D. Electron arrangement
  - E. Electron arrangement vs. Reactivity
  - F. Chemical bonding
    - 1. Ionic bonding
    - 2. Covalent bonding
      - polar
      - non-polar
    - 3. Hydrogen bonding
    - 4. van der Waals Forces
  - G. Molecules, formulae, equations
  - H. Biologically important compounds
    - 1. Inorganic compounds
      - a) Acids
      - b) Bases
      - c) Salts
      - d) Water
    - 2. Organic compounds
      - a) Carbohydrates
      - b) Lipids
      - c) Proteins
      - d) Nucleic acids
      - e) (Amines/ Vitamins)
- III. Cells
  - A. The cell theory
  - B. The cell and its parts (structure and function)
    - 1. Membrane
    - 2. Endoplasmic reticulum
    - 3. Ribosomes
    - 4. Golgi complex
    - 5. Mitochondria
    - 6. Vacuoles
    - 7. Chloroplasts & Plastids
    - 8. Cytoskeleton

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- a) Centrioles/Centrosome
- b) Cilia and flagella, pseudopodia
- 9. Nucleus
- C. Prokaryotic vs. eukaryotic cells
- D. Plant vs. animal cells

### **IV. The cell membrane/wall**

- A. The cell membrane/wall
  - 1. structure
  - 2. function
- B. The transport of materials across the membrane
  - 1. Passive transport
    - a) osmosis
    - b) diffusion
    - c) dialysis
  - 2. Active transport
  - 3. Bulk Transport
    - a) Endocytosis
      - (1) pinocytosis
      - (2) phagocytosis
    - b) Exocytosis
    - c) Filtration

### **V. Energy transformations**

- A. Natural Laws that govern chemical reactions
  - 1. The first law of thermodynamics
  - 2. The second law of thermodynamics
  - 3. Entropy and enthalpy
- B. Cell energy
  - 1. ATP & GTP
- C. Metabolism
  - 1. Anabolic reactions
  - 2. Catabolic reactions
- D. Enzymes
  - 1. Characteristics
  - 2. Chemical and physical properties
  - 3. Classification
  - 4. Action
  - 5. Inhibition
- E. Cellular respiration
  - 1. Glycolysis (aerobic and aerobic respiration)
  - 2. Transfer reaction
  - 3. Krebs's cycle (citric acid cycle)
  - 4. Electron transport chain and chemiosmosis
  - 5. Fermentation
- F. Photosynthesis
  - 1. Requirements
  - 2. Light reaction (photophosphorylation)
  - 3. Dark reaction (carbon fixation)

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## VI. The cell cycle

- A. Control of cycle
  - 1. Cancer
- B. Stages
  - 1. Interphase
    - a) (G<sub>1</sub>) - Gap I phase
    - b) (S) - Synthesis phase
    - c) (G<sub>2</sub>) - GapII phase
  - 2. Mitosis
    - a) Prophase
    - b) Metaphase
    - c) Anaphase
    - d) Telophase
- C. Meiosis
  - 1. Gametogenesis
    - spermatogenesis
    - oogenesis

## VII. Genetics

- A. Genes
  - 1. Composition
  - 2. Function
- B. Chromosomes
  - 1. Structure
  - 2. Role
  - 3. Number
- C. Mendelian inheritance
  - 1. Dominance
  - 2. Independent assortment
  - 3. Segregation
- D. Monohybrid and dihybrid crosses
  - 1. Homozygous vs.Heterozygous organism
  - 2. Genotype vs.Phenotype
  - 3. Alleles
  - 4. Dominance vs.Recessive
- E. Laws of Probability
  - 1. The sum law
  - 2. The product law
  - 3. Application
- F. Gene interaction
  - 1. Incomplete dominance
  - 2. Epistasis
  - 3. Codominance
- G. Quantitative genetics
  - 1. Polygenic inheritance
  - 2. Multiple alleles
  - 3. Pleiotropy
- H. Sex-linked traits

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1. The sex determining chromosome
2. X-linked (and influenced) genes
  - a) color blindness
  - b) hemophilia
3. Y-linked genes

### **VIII. Human genetics**

#### **A. Chromosomal abnormalities**

1. Aneuploidy (irregular numbers)
  - a) Monosomic cells
  - b) Trisomic cells

#### **B. Genes and disease**

1. Sickle cell
2. Cystic fibrosis
3. Neurofibromatosis
4. Huntington disease
5. Tay-Sachs disease
6. PKU
7. Trisomy 21 (Down's syndrome)
8. Turners syndrome
9. Klinefelters syndrome
10. Super males?
11. Meta female

#### **C. Chromosomal aberrations**

1. Mutation
2. Deficiency
3. Duplication
4. Inversion
5. Translocation

### **IX. DNA and the genetic code**

#### **A. Protein synthesis**

1. DNA
2. Transcription
3. Translation

### **TIME PERMITTING:**

### **X. Gene regulation (operon theory)**

#### **A. Regions**

1. Operator regions
2. Promoter region
3. Regulator gene
4. .Structural gene

### **XI. Genetic engineering**

- A. Enzymes involved
- B. Common Techniques

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**Tentative** Course Schedule for Spring 2012

YOU ARE ENCOURAGED TO READ THE TEXT SECTIONS PRIO TO CLASS.

WEEK OF	Unit/topic	Lecture Chapter(s)	LAB <i>Subject to change</i>	EXAM/UNIT TESTS
Jan 23	I Intro, basic chem	1,2	White Powders	
Jan 30	II Biol. Chem	3,4	Intro Chemistry/Nature of Science	
Feb 6		5	Chemistry for Biology	
Feb 13			Enzymes I	TEST #1 Unit I and II
Feb 20	III Cells	NO CLASS Pres. Day	Microscopes & Cells	
Feb 27		6	Microscopes & Tissues	
Mar 5		7	Diffusion/Osmosis	
Mar 12			Diff and Osmo II	
Mar 19	NO CLASSES SPRING BREAK			
Mar 26	IV Cellular Energy	8, 9	Cell Respiration I Fermentation	
Apr 2		9	Cell Resp and Photosynthesis	TEST #2 Unit III & IV
Apr 9	V Cell division	10	Mitosis/Meiosis I	
Apr 16		10, 11	Mitosis/Meiosis II Genetics I	
Apr 23		12, 13	Human Genetic Variation	
Apr 30	VI Genetics	14	Electrophoresis	
May 7		15, 16	Transcription/Translation Lecture in lab?	TEST #3 Units V & VI
May 14		18	<b>CUMULATIVE FINAL EXAM</b>	



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