Biology 121: General Biology 1
Three Rivers Community College, Norwich, CT
Instructor: Karen Cryan
Office Hours:5:30-6:30 M/W or by appointment
E-Mail: KCryan@QVCC.Commnet.edu
Room: Lecture D105; Laboratory A215

Required Text*: Biology:The Dynamic Science*, by Russel, Hertz, and McMillan. This text was designed specifically for Three Rivers Community College and for this class. It is a modified version of a larger book. Because of that you will find that chapters not covered in this class are not included in the text, this reduces your costs in purchasing the book. In addition to this book you are encouraged to explore other available resources including other texts.

Course Prerequisites: Current enrollment or a passing grad ("C" or better) in English 101 and Chem 101 or an equivalent course. Knowledge of 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 the life processes common to all organism and their strategies for survival. 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 to be covered is attached. This course meets for 3 hours of lecture and 3 hours of lab weekly for a total of 4 credit hours.

Course Objectives:
To develop and understanding of:

1.) The Biological Sciences as they relate to other sciences
2.) The life processes and the interrelationships between man and other living organisms.
3.) The interdependence of all life forms operating on natural laws that ensures stability to these life forms.
4.) To encourage the student to become aware of and/or more knowledgeable in relation to current biological concerns such as pollution, chemical influences, overpopulation, energy, and genetic engineering.
5.) 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 required. Absences are counted from the first meeting of class. More than 4 consecutive or more than 6 accumulated absences could result in a student receiving an "F" grade in this course. 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 with a classmate for obtaining lecture notes. You are responsible for all missed material.

Electronic devices: Electronic devices (cell phones, pagers, music players) must be turned off during both lecture and laboratory. Reminder: it is not possible to send text messages with a phone that is turned off. If there is an emergent need to have a phone in the classroom turned on, please notify the instructor BEFORE class and keep phone in silent mode to reduce distractions to others.

Grade Evaluation: There will be 3 unit examinations and 9 quizzes. The lowest two quiz grades will not be counted in your average. Two lab tests will be given in addition to written lab reports. A cumulative final exam will be administered during finals week. Exam and quiz question will consist of multiple choice, short answer, and/or essays. Your grade will be based on the following:

Semester Grade* ---------- 50%
Laboratory Grade**------ 25%
Final Examination ------- 25%
100%

*Semester grade derived from Unit exams and Quizzes (12% for each test, and 2% for each counted quiz)
**Laboratory grade is derived from average of 2 lab exams and points for written lab reports.

Grading System:

100-93.5=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 Dec 9th. 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 cane 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. Because the lowest 2 quiz grades are dropped, make-up quizzes are rarely (if ever) granted.
Laboratory participation is expected and required. However, attendance will not satisfy the lab grade portion of the course and write ups are required. Full credit will not be given for a lab write-up if you did not participate in the actual lab. Due to scheduling issues, individual lab make-ups are not feasible. Lab make-ups can be accommodated at the discretion of another instructor during their lab session.

Syllabus revisions: The attached schedule is subject to change as the instructor sees appropriate. Any changes will be announced in advance.

Course Objectives: BIO 121-General Biology I

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 photophosphrylation 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.

Topical Course Outline: BIO 121- General Biology I

Unit 1

I.) Introduction

A) The early history and the development of "Biology" as a science.

1. The scientific method.
2. Biology as a science.

B) The characteristics of life.

1. Organization and levels of organization.
2. Irritability.
3. Adaptability.
4. Movement.
5. Metabolism.
6. Growth.
7. Reproduction.

II.) The Chemistry of Life

A) Matter

1. Matter defined.
2. The composition of matter.
3. The basic forms of matter
    a) Solids b) Liquids c) Gases

B) How the elements differ.

1. The atom theory.
2. The atom and its structures.
    a) Protons b) Electrons c) Neutrons
3. The atomic number of elements.
4. The atomic nucleus and the atomic mass unit (atomic weight) of elements.
5. Isotopes.

C) Energy level and sublevels and electron arrangement.

1. Electron capacity for energy levels and sublevels.
2. Valence.

D) Electron arrangement versus reactivity.

1. Chemical bonding.
    a) Ions and ionic (electrovalent) bonding
    b) Covalent bonding
        1) Polar covalent bonding
        2) Non-polar covalent bonding
    c) Hydrogen bonding
2. Molecules and Formula Units.

E) Elements common to living organisms and their biological role.

1. Hydrogen
2. Carbon.
3. Nitrogen.
4. Oxygen.
5. Phosphorous.
6. Sulfur.
7. Sodium.
8. Chlorine.
9. Calcium.
10. Iron.
11. Magnesium.
12. Trace elements.

F) Inorganic compounds important to living organism and their biological role.

1. Water.
2. Acids.
3. Bases.
4. Salts.

G) Organic compounds important to living organism and their biological role.

1. Carbohydrates.
2. Lipids.
3. Proteins.
4. Nucleic Acids.
5. Amines (Vitamins)

III.) Cells

A) The cell theory

B) The major differences between prokaryotic cells and eukaryotic cells.

C) The cytoplasmic organelles in eukaryotes their structural makeup and their function.

1. Endoplasmic reticulum.
2. Golgi complex.
3. Mitochondria.
4. Chloroplast (Plastids)
5. Lysosomes.
6. Ribosomes.
7. Centrosomes and Centrioles.
8. Cytoskeleton.
9. The nucleus.

D) The major differences between plant and animals cells.

E) The Appendages of the cell.

1. Flagella.
2. Cilia.
3. Pseudopodia?

F) The Cell's Membrane.

1. Composition and function.
2. Membrane transport mechanisms.
    a) Diffusion
    b) Facilitated diffusion.

c) Osmosis.
d) Dialysis.
e) Active transport.
f) Endocytosis
1) Phagocytosis.
2) Pinocytosis.
g) Exocytosis.
h) Filtration.

IV.) The nucleus and cellular reproduction.

A) The cell's cycle of growth and the genetic controls of the process.

1. Interphase.
a) G_1 or Gap lor Growth phase I
b) S or Synthesis phase
c) G_2 or Gap II or Growth phase II
2. Mitosis.
a) Mitosis defined
b) The phases of mitosis
1) Prophase
2) Metaphase
3) Anaphase
4) Telophase
3. Cytokinesis
4. The major differences between mitosis in plant and animal cells.

B) Meiosis

1. Meiosis defined.
2. The Phase of meiosis.
a) Reduction division - Meiosis I
1) Prophase I
2) Metaphase I
3) Anaphase I
4) Telophase I
b) Equational division - Meiosis II
1) Prophase II
2) Metaphase II
3) Anaphase II
4) Telophase II
c) Gametogenesis
1) Spermatogenesis
2) Oogenesis
3) Microsporogenesis
4) Megasporogenesis

Unit II

I) The differentiation and specialization of cells (Tissues or Histology)

A) Tissues defined.

B) The major classes of animal tissues basic structure and function.

- 1) Epithelial.
  - a) Simple squamous
  - b) Simple cubodial
  - c) Simple columnar
  - d) Stratified squamous
  - e) Stratified cubodial
  - f) Stratified columnar
  - g) Psuedo-stratified ciliated columnar
- 2) Connective.
  - a) Loose connective
    - 1) Aerolar
    - 2) Adipose
  - b) Dense connective
    - 1) Tendons
    - 2) Ligaments
  - c) Special connective tissue
    - 1) Reticular tissue
    - 2) Blood
    - 3) Bone
    - 4) Cartilage
- 3) Muscle.
  - a) Smooth
  - b) Cardiac
  - c) Skeletal
- 4) Nervous.
  - a) Neurons
  - b) Neuroglial
- 5) Membranes.
  - a) Cutaneous
  - b) Mucous
  - c) Serous
  - d) Synovial

C) 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 tissue.
a) Parenchyma cells
b) Chloroenchyma cells
c) Collenchyma cells
d) Sclerenchyma cells

II) Energy Transformations.
A) Energy and chemical reactions.
1) The first law of thermodynamics.
2) The second law of thermodynamics.
B) The cell's energy coupling molecules.
1) ATP.
2) GTP.
C) Metabolism.
1) Anabolic reactions.
2) Catabolic reactions.
D) Enzymes (defined).
1) Chemical compositions of enzymes.
2) The actions of enzymes.
3) The classification of enzymes.
4) Factor that affect enzymatic action.
E) Photosynthesis (defined).
1) Essential factors of photosynthesis.
a) Reactants - water and carbon dioxide
b) Reaction centers - chloroplast and the chlorophyll pigment centers.
c) Sources of energy - light
2) The process of photosynthesis
a) The light reaction - Photophosphrylation (non-cyclic vs. cyclic).
b) The carbon fixation phase - The Calvin-Benson cycle.
F) Cellular respiration (defined).
1) The mechanism of Glycolysis.
2) The mechanism of the Kreb's cycle.
3) The mechanism of the Oxidative Phosphorylation process - electron transport chain.
4) Anaerobic metabolism - Fermentation.

Unit III

I) Genetics

A) Mendel and his work.

B) The law of segregation of gametes.

C) The law of independent assortment.

D) Meiosis and Genetics

E) Terms and Concepts.

1. Chromosomes.
2. Locus (Loci)
3. Genes.
4. Alleles.
    a) Homozygous
    b) Heterozygous
5. Dominance.
6. Genotype.
7. Phenotype
8. Incomplete dominance.
9. Co-dominance.
10. Recessive.
11. Hybrids.
12. Epistasis genes.
13. Parent generation (PI)'
14. First filial generation (FI).
15. Second filial generation (F2).

F) Types of Genetic Crosses and their genotypica1 and phenotypical ratios.

1. Monohybrid crosses.
2. Back crosses.
3. Test crosses.
4. Dihybrid crosses.

G) Gene interaction.

1. Epistasis and epistatic ratios.
2. Complementary genes & their ratios.
3. Supplementary genes & their ratios.

H) Quantitative inheritance.

1. Multiple alleles.
2. Polygenic inheritance.

I) Sex linked traits.

1. The sex determining chromosomes some representative organisms.
2. X-linked traits.
3. Y-linked traits.

J) Hardy- Weinberg and its applications

1. Population genetics.

K) Linkage and chromosome mapping
L) Changes in chromosomes numbers.
    1. Aneuploid cells.
    2. Monosomic cells.
    3. Trisomic cells.
    4. Polyploid cells.
M) Chromosomal aberrations.
    1. Mutations.
    2. Deletions
    3. Duplications.
    4. Translocation.
    5. Inversions.
N)Genes and Diseases.
    1. Sickle cell anemia
    2. Thalassemia.
    3. Tay-Sachs disease.
    4. PKU
    5. Cystic fibrosis.
    6. Lesch-Nyhans disease.
    7. Some other genetic disorders.
O)The role of DNA and RNA in inheritance.
    1. How genes are regulated in prokaryotic and eukaryotic cells.
        a) The operon theory
            1) The promoter region
            2) Operator genes.
            3) Regulator genes.
            4) Structural genes.
        b) Other regulatory processes.
    2. Protein Synthesis.
        a) Transcription.
        b) Translation.

II.) Evolution.
A) Heredity and Evolution.
    1. Historical perspective.
    2. Evidence of evolution.
    3. Adaptation and evolution.
    4. Modem concepts of evolution.

TENTATIVE ACADEMIC SCHEDULE - Ms. Karen Z. Cryan, Instructor

BIO 121 General Biology I

LECTURE: 6:30pm – 9:30pm Monday – Room D105

LAB: 6:30pm – 9:30pm Wednesday - Room A215

WEEK – DATE		********* LESSONS **********
1	**8/31**	Handout Syllabus **LAB: Safety & Equipment & The Scientific Method**
2	9/05	Labor Day – No Class
2	**9/07**	**LAB: Introduction to the Microscope**
3	9/12	***Lecture***: Orientation/ The Scientific Method/ Characteristic of Life/– Required reading Chapters 1, 2,
3	**9/14**	**LAB: (Chemistry)** required reading, chapter 3.1
4	9/19	Quiz 1 / Chemistry of life / The Cell - Structures and Their Functions – Required reading - Chap. 3 & 4
4	**9/21**	**LAB: The structure of the cell – models and microscope study** read 4.3-5.2
5	9/26	Quiz 2 / The cell's membrane and it's functions –Required reading chapters5, 6, 7
5	**9/28**	**LAB: Diffusion and Osmosis**
6	10/3	Quiz 3 / Cell Division (Mitosis and Meiosis) - Required reading Chaps 10 & 11
6	**10/05**	**LAB: Mitosis Slides of Plants and Animal Mitosis / Meiosis**
7	10/10	** UNIT TEST 1 from 6:30pm – 7:55pm **/ Break 7:55pm – 8:15pm / LECTURE: 8:15pm – 9:30pm – Animal Tissues - Required reading – Chap. 36
7	**10/12**	**LAB: Lab Practical (Test) I - 6:45pm – 8:20pm** **Lecture: 8:30pm – 9:30pm – Plant tissues**
8	10/17	Quiz 4/ Animal Tissues cont'd. / Plant Tissues – Required reading – Chapter 3
8	**10/19**	**LAB: Animal Tissues slides**
9	10/24	Quiz 5/ Cellular respiratory and fermentation – Required reading – Chapter 8
9	**10/26**	**LAB: Animal Tissues slides cont'd.**
10	10/31	Quiz 6 / Photosynthesis – Required reading Chapter 9
10	**11/02**	**LAB: Plant Tissues slides**
11	11/7	**UNIT TEST** from 6:30pm – 7:55pm / Break 7:55pm – 8:15pm / Lecture / 8:15pm – 9:30pm Mendelian Genetic – Required reading – Chapter 12
11	**11/09**	**LAB: Photosynthesis**
12	11/14	Genetics – Required reading – Chapters 12, 13, 14
12	**11/16**	**LAB: Dragon Genetics**
13	11/21	Quiz 7/ Genetic cont'd
13	11/23	Quiz 8/ Molecular Genetics – Chaps. 15, 16, 17

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14	11/28	Quiz 9 / DNA replication / Protein synthesis (transcription and translation) Chapters 15,16,17
14	**11/30**	**LAB: Lab Practical Test II**
15	12/05	Gene expression and Genetic engineering – Required reading – Chapters 17 & 18
15	**12/07**	**LAB: Problem solving in Genetics**
16	12/12	UNIT TEST III
16	12/14	******* Review Unit Test 3 & Semester**********
17	12/19	FINAL EXAM – 6:30PM – 8:45PM