

**Trumbull Career & Technical Center**  
**Biotech Prep I/II + BioChemistry I/II Course Syllabi**  
**2011-2012**  
Mr. Alvetro

**Course Description:**

The Biotechnology Tech Prep program exposes students to the fundamental practices of an analytical biological laboratory. Students will learn to practically apply the concepts of biotechnology and biochemistry in real-life laboratory exercises that will stress the use of proper technique and application of the scientific process. Course material will draw from the realms of general biology, general chemistry, biochemistry, organic chemistry, and molecular biology. Students who enroll in the Biotechnology Tech Prep program will also be simultaneously enrolled in biochemistry.

**Instructional Philosophy:**

I firmly believe that young people are the most enthusiastic and talented individuals that I have ever worked with. *I believe that they can achieve greatness when greatness is expected of them.* Therefore, I hold all of my students to a very high standard. I will expect a great deal from each of them and they should expect a great deal from me. I see science as the most important subject for today's young people to master. As our world becomes more and more dependent on science and technology, fewer and fewer people understand that science and technology upon which they so greatly depend. To remedy this, I choose to present science in a meaningful reality-based context. Students will be exposed to the basic concepts of biology, biochemistry, and molecular biology in such a way as to further their understanding of the world that surrounds them. I rely heavily on lab-based assignments in which students benefit from "hands-on" activities. I see the ultimate goal of my instruction as the awakening of students to look at their world and all that surrounds them through the eyes of a scientist.

**Course Goals & Objectives:**

- 1) Students will develop an understanding of and illustrate the use of the scientific method in real-life biology and chemistry laboratory activities.
- 2) Students will develop an understanding of and put into practice accepted research techniques.
- 3) Students will understand the importance of the proper handling of biohazardous material and laboratory chemicals.
- 4) Students will demonstrate safe lab practices and acquire skills associated with the appropriate use of laboratory equipment.
- 5) Students will demonstrate the ability to take data from experimentation and develop a formal written report.

**Assessment Plan:**

- 1) Examinations and announced quizzes = **50%** of the nine-weeks grade
- 2) Homework and unannounced quizzes = **20%** of the nine-weeks grade
- 3) Laboratory activities and reports = **30%** of the nine-weeks grade

**Grading Scale:**

See Student Handbook for school-wide grading scale.

**Job Shadowing:**

To increase student awareness of career opportunities, TCTC requires senior students to participate in a school-wide “Job Shadowing Day”. To meet this requirement, senior students must make the appropriate arrangements and follow the prescribed procedures as set forth in the “Job Shadowing Handbook”. Further information on job shadowing will be distributed to senior students in the fall of their senior year by their program instructors.

**Senior Project:**

Starting with the 2006-2007 school-year, all senior TCTC students will be required to complete an extensive senior project. This senior project is an opportunity for the students to showcase their talents and skills (technical and academic) as related to their particular area of study at TCTC. The exact requirements for the senior projects will be distributed to all senior students in the fall of their senior year.

**OSHA Training:**

Teaching students to work safely is more important than teaching any skill in any program. The TCTC has made passing the 10 Hour OSHA safety course a requirement for successful completion of this program. This nationally recognized certificate will go into the student’s portfolio upon completion, and because safety is so important to employers these days, it gives our students an important advantage when applying for a job. The \$18 nominal fee (\$275 if taken after graduation) is part of the program fees and may be re-assessed if the student fails to complete the initial test successfully. Students will not receive their State Certificates of Program Completion if they do not successfully complete this test.

**Plagiarism:**

In the academic world, a person’s thoughts, ideas, and products are considered to be property and are protected as such. It is a grave infraction of academic honesty to take another individual’s work and present it as one’s own without proper citation of the original source. On occasion, you, the student, will be required to produce written work that will require the research and citation of outside sources. Whenever this takes place, you should resist the urge to take another person’s written work and present it as your own. Any form of plagiarism will not be tolerated in this class and will be dealt with according to the approved student code of conduct.

**Cheating:**

In today’s world, students too often focus their attention on the grade they receive in a class rather than what they actually learned. Therefore, some students feel that the importance of receiving the “A” on a report card supercedes everything else. I assure you that nothing can be farther from the truth. I place the acquisition of knowledge and skills far above any grade that you may earn. Because of this, I feel that cheating on examinations or quizzes only serves to undermine your true learning. Therefore, any student who is caught cheating on any examination, quiz, or any other assessment will be dealt with according to the approved student code of conduct.

**Articulation Agreements:**

As a student of the Biotechnology program at TCTC you will have the opportunity to earn a substantial number of college credits from both Youngstown State University and Kent State University. However, these credits will only be awarded to students who meet performance standards as set forth by university faculty. Students must earn at least a “B” average over the two years in a particular subject and exhibit exemplary attendance in order to be eligible for college credit. For additional information on college credit, please reference the attached articulation agreements.

**Contact Information:**

I welcome you and your parents to contact me at any time to ask questions, express concerns, or discuss your progress. Use the below information to contact me whenever needed.

E-mail: [Michael.Alvetro@NEOMIN.org](mailto:Michael.Alvetro@NEOMIN.org)

## Course Content

### **Biotechnology Competencies**

- a. Conducting experiments
- b. Laboratory Safety and Maintenance
- c. Instrument Analysis
- d. Chemical Materials Handling and Sampling
- e. Physical Properties Measurement
- f. Biohazard Storage, Handling and Disposal
- g. Microbiology
- h. Biochemical and Molecular Biology Technology
- i. Cell Culturing
- j. Protein Separation methods
- k. Fermentation Technology
- l. Bioethics
- m. Introduction to Industry
- n. Technical Writing and Documentation
- o. Computer Applications
  1. Database Administration
  2. Data Warehousing
  3. Statistics

### **Biology Strand (Jr. year)**

- I. The Origin of Living Things
  - a. The Science of Biology
  - b. Nature of Molecules
  - c. Chemical Building Blocks of Life
- II. Biology of the Cell
  - a. Cell Structure
  - b. Cell-Cell Interactions
  - c. Energy and Metabolism
  - d. Photosynthesis
  - e. Cell Division
- III. Genetic and Molecular Biology
  - a. Meiosis and patterns of inheritance
  - b. DNA
  - c. Genes and Gene Technology
  - d. Genomes
  - e. Control of Gene Expression
  - f. Cellular Mechanisms of Development
  - g. Molecular Biology and Medicine
- IV. Evolution
  - a. Genes within Populations
  - b. Evidence for Evolution
  - c. The Origin of the Species
  - d. Evolution of Genomes and Developmental Mechanisms
- V. Classification of Organisms
  - a. Phylogeny and Systematics
  - b. Viruses
  - c. Bacteria

## Chemistry Strand (Jr. year)

- I. Matter and Measurement
  - a. Classification and Properties of Matter
  - b. Units of Measurement
  - c. Dimensional Analysis
- II. Atoms, Molecules and Ions
  - a. Atomic Theory of Matter
  - b. Atomic Structure
  - c. The Periodic Table
  - d. Ions and Ionic Compounds
  - e. Molecules and Molecular Compounds
  - f. Naming Chemical Compounds
- III. Stoichiometry
  - a. Chemical Equations
  - b. Types of Reactions
  - c. The Mole
  - d. Empirical Formulas
  - e. Limiting Reactants
- IV. Molarity
  - a. Concentration of Solutions
  - b. Titrations
- V. Gases
  - a. Characteristics of Gases
  - b. The Gas Laws
  - c. Gas Mixtures and Partial Pressures
  - d. Molecular Effusion and Diffusion
- VI. Thermochemistry
  - a. First Law of Thermodynamics
  - b. Enthalpy
  - c. Calorimetry
  - d. Hess's Law
  - e. Foods and Fuels
- VII. Basic concepts of chemical bonding
  - a. Lewis structures
  - b. Ionic bonding
  - c. Covalent bonding
  - d. Electronegativity and bond polarity
- VIII. Intermolecular forces
  - a. Properties of Liquids
  - b. Structure of Solids
- IX . Electrolytes
  - a. Precipitation reactions
  - b. Acid-base reactions
  - c. Redox reactions

## **Biology Strand (Sr. year)**

- I. Evolution
  - a. Genes within Populations
  - b. Evidence for Evolution
  - c. The Origin of the Species
  - d. Evolution of Genomes and Developmental Mechanisms
- II. Classification of Organisms
  - a. Phylogeny and Systematics
  - b. Viruses
  - c. Bacteria
  - d. Plants – form and function, transport, nutrition, defense and reproduction
  - e. Animal Diversity
- III. Human Anatomy and Physiology
  - i. Locomotion
  - ii. Digestion
  - iii. Circulation and Respiration
  - iv. Nervous system
  - v. Endocrine system
  - vi. Immune system
  - vii. Reproductive system and embryology
- IV. Ecology
  - a. Behavioral biology
  - b. Population ecology
  - c. Community ecology

## **Chemistry Strand (Sr. year)**

- I. Basic concepts of chemical bonding
  - a. Lewis structures
  - b. Ionic bonding
  - c. Covalent bonding
  - d. Electronegativity and bond polarity
- II. Intermolecular forces
  - a. Properties of Liquids
  - b. Structure of Solids
- III. Electrolytes
  - a. Precipitation reactions
  - b. Acid-base reactions
  - c. Redox reactions
- IV. Solution Chemistry
  - a. Solution formation
  - b. Solubility
  - c. Ways to express concentration
  - d. Colligative properties
  - e. Colloids
- V. Chemical Equilibria
  - a. Equilibrium constant
  - b. Le Chatelier's Principle
- VI. Acid-Base Equilibria
  - a. Bronsted-Lowry Acids and Bases
  - b. The pH scale

- c. Strong acids and bases
- d. Weak acids and bases
- e. Lewis acids and bases
- VII. Aqueous equilibria
  - a. Common ion effect
  - b. Buffered solutions
  - c. Acid base titrations
  - d. Separation of ions
  - e. Qualitative Analysis
- VIII. Chemical bonding
  - a. Resonance
  - b. Bond enthalpies
- IX. Molecular Geometry
  - a. Molecular shapes
  - b. VESPR model
  - c. Molecular polarity
  - d. Multiple bonds
- X. Organic chemistry
  - a. Introduction to Hydrocarbons
  - b. Alcohols and Ethers
  - c. Chirality
  - d. Esters
  - e. Carboxylic acids
- XI. Electrochemistry
  - a. Redox review
  - b. Voltaic cells
  - c. Cell EMF
  - d. Batteries
  - e. Corrosion
  - f. Electrolysis

**Textbooks Utilized:**

**Chemistry: The Central Science**

By: Brown, Lemay and Bursten  
9<sup>th</sup> edition

**Biology**

By: Raven and Johnson  
8<sup>th</sup> edition

**General, Organic, & Biochemistry**

By: Karen Timberlake