



EFFECTIVE: SEPTEMBER 2004 CURRICULUM GUIDELINES

A. Division: **Science and Technology** **Effective Date:** **September 2004**

B. Department / Program Area: **Biology** **Revision** **New Course**

If Revision, Section(s) Revised: **C, H, M, R**

Date of Previous Revision: **September 2003**

Date of Current Revision: **September 2004**

C: Biology 2421 **D: Cell Biochemistry** **E: 3**

Subject & Course No.	Descriptive Title	Semester Credits
----------------------	-------------------	------------------

<p>F: Calendar Description:</p> <p>An introduction to the biochemistry of a cell, including the structural and functional aspects of the micro and macro molecules. Protein structure, enzyme kinetics, and energy pathways will be considered. Some metabolic sequences in the cell will be examined in relation to control mechanisms.</p>		
--	--	--

<p>G: Allocation of Contact Hours to Type of Instruction / Learning Settings</p> <p>Primary Methods of Instructional Delivery and/or Learning Settings:</p> <p>Lecture/Tutorial/Lab</p> <p>Number of Contact Hours: (per week / semester for each descriptor)</p> <p>Lecture: 3 hours/week</p> <p>Tutorial: 1 hour/week</p> <p>Number of Weeks per Semester:</p> <p style="text-align: center;">15 weeks</p>	<p>H: Course Prerequisites:</p> <p>Biology 2321 and Chemistry 320 or permission of the instructor.</p> <p>I: Course Corequisites:</p> <p>Chemistry 420</p> <p>J: Course for which this Course is a Prerequisite</p> <p style="text-align: center;">None</p> <p>K: Maximum Class Size:</p> <p style="text-align: center;">35</p>
---	---

L: PLEASE INDICATE:

	Non-Credit
	College Credit Non-Transfer
X	College Credit Transfer:

SEE BC TRANSFER GUIDE FOR TRANSFER DETAILS (www.bccat.bc.ca)

M: Course Objectives / Learning Outcomes

Upon completion of Biology 2421, the student will be able to:

- Describe the chemistry of water, acid-base properties, and buffers.
- Describe the chemistry of amino acids.
- Explain how protein sequence is determined, and describe the structure of peptides.
- Describe the structure of proteins, especially in terms of how this structure relates to function
- Describe what allosteric proteins are, and their importance.
- Describe the structure, function, and behaviour of hemoglobin and myoglobin.
- Describe enzyme kinetics
- Explain basic bioenergetic principles as they relate to catabolism in the cell – free energy, coupled reactions, nucleotides.
- Describe the chemistry of carbohydrates – structure and function
- Explain in detail the process of cellular respiration – glycolysis, Krebs cycle, electron transport and ATP synthesis.
- Describe anabolism in the cell in terms of gluconeogenesis.
- Describe the biosynthesis of macromolecules (specifically polysaccharides) in terms of glycogen synthesis, and describe the degradation of macromolecules in terms of glycogenolysis.
- Describe metabolic control in the cell and energy charge.
- Describe regulation in the cell in terms of hormone action.
- Provide brief descriptions of alternative oxidative pathways – i.e. lipid and fatty acid oxidation, amino acid oxidation, the phosphogluconate pathway.
- Provide a brief overview of human metabolism in terms of interrelationships between the catabolic and anabolic pathways discussed during the course of the semester.

N: Course Content:

The major topics in the course include the following:

1. An Introduction – What is Biochemistry?
2. Proteins:
 - Water and Acid-Base concepts
 - Amino acids, peptides, and proteins
 - The Henderson-Hasselbalch Equation
 - PH, pK, and pI.
 - Electrophoresis
 - Peptide sequencing
 - Protein structure
 - Titration curves of amino acids and peptides

Course Content: (cont.)

3. Globular proteins
 - Myoglobin (Mb) – structure, function, and behaviour
 - Hemoglobin (Hb) – structure, function, and behaviour
 - Major differences between myoglobin and hemoglobin
 - Adult hemoglobin versus fetal hemoglobin
 - The effect of certain metabolites (i.e. H⁺ ions, CO, and BPG) on hemoglobin
 - Sickle cell anemia and its effect on hemoglobin structure and function

4. Enzyme Kinetics
 - Enzymes as biological catalysts
 - Reaction rates
 - The specificity of enzymes for their substrates
 - Specific catalytic groups and their contribution to catalysis
 - Substrate concentrations
 - The Michaelis-Menten Equation
 - Lineweaver-Burk plots
 - The meaning of V_{max} and K_m as they relate to enzymes
 - Reversible and irreversible inhibition
 - The affect of pH on enzyme activity
 - Allosteric enzymes, and how their kinetics differ from those of non-allosteric enzymes

5. Bioenergetics
 - The Laws of Thermodynamics – a short review
 - Entropy
 - Standard and Actual Free-Energy Change
 - The Equilibrium Constant
 - Coupled reactions
 - Phosphate group transfers and ATP

6. Catabolism
 - Glycolysis
 - The Tricarboxylic Acid Cycle or Krebs Cycle
 - The Electron Transport System
 - The Glycerol-Phosphate and Malate-Aspartate Shuttle Mechanisms
 - Gluconeogenesis
 - Glycogen metabolism – Glycogen synthesis and Glycogenolysis
 - Other alternative oxidative pathways
 - The effect of hormones on metabolism
 - Integration of metabolism

O: Methods of Instruction

This course involves three hours a week of classroom instruction and one hour a week of tutorials in which selected problems from the textbook are solved.

P: Textbooks and Materials to be Purchased by Students

Nelson and Cox, 2000. *Lehninger – Principles of Biochemistry* (3rd edition). New York: Worth Publishers.

Q: Means of Assessment

<u>TYPE OF EVALUATION</u>	<u>POINTS</u>
Class tests	10-25
Two term examinations	30-50
One final examination	<u>30-40</u>
TOTAL	100

Grades: A+ 95-100, A 90-94, A- 85-89, B+ 80-84, B 75-79, B- 70-74,
C+ 65-69, C 60-64, C- 55-59, P 50-54, F 0-49

R: Prior Learning Assessment and Recognition: specify whether course is open for PLAR

There is no provision of PLAR, other than that normally done by examining transcripts and comparing course outlines of Biochemistry courses taken within the last five years elsewhere to the Douglas College Biology 2421 course content.

 Course Designer(s)

 Education Council / Curriculum Committee Representative

 Dean / Director

 Registrar