



M: Course Objectives / Learning Outcomes

Upon completion of Biology 421, 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:

An Introduction – What is Biochemistry?

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

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

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

Dean / Director

Registrar

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