

SPRINGFIELD TECHNICAL COMMUNITY COLLEGE

ACADEMIC AFFAIRS

Course Number: BIOL 140 Department: Biology

Course Title: Biochemistry/Health Sciences Semester: Spring Year: 1997

Objectives/Competencies

Course Objective	Competencies
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1. Understand the basic of inorganic and organic chemistry.	<ol style="list-style-type: none">1. Define the terms matter, mass, weight, element, and atom.2. Describe the subatomic particles of an atom using the terms atomic number, mass number, and electron cloud.3. Explain ionic bonding, covalent bonding, and metallic bonding.4. Describe polar covalent bonds and hydrogen bonds.5. Distinguish between a molecule and a compound.6. Define dissociate and electrolyte.7. Define solution, solvent and solute.8. List the properties of water that make it important for living organisms.9. Define acid and base, and differentiate between a strong and /or and a weak acid or base.10. Describe the pH scale.
2. Understand why proteins are vital to life.	<ol style="list-style-type: none">1. Understand that proteins contain the form of nitrogen most easily used by the human body.2. List and discuss the diverse functions of proteins.3. Discuss the composition of proteins.
3. Be able to discuss the structure of amino acid.	<ol style="list-style-type: none">1. Diagram and understand the basic structure of an amino acid.2. List the 20 amino acids. Identify the 9 amino acids which must be consumed in food and so are essential parts of a diet.3. Write the structure of six amino acids:<ol style="list-style-type: none">a. Alanine

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	<ul style="list-style-type: none">b. Lysinec. Glutamic acidd. Tyrosinee. Cysteinef. Leucine
4. Identify the properties of amino acids.	<ol style="list-style-type: none">1. Describe the amphoteric characteristics of an amino acid and understand its significance in the maintenance of homeostatic pH regulation.2. Discuss the significance of the isoelectric point and its relationship to solubility.3. Describe the two stereoisomers of amino acids – D and L forms.
5. Understand proteins are polymers of amino acids.	<ol style="list-style-type: none">1. Demonstrate, using a dehydration synthesis reaction, the formation of a peptide bond.2. Write the structure of an octapeptide.3. Distinguish between complete and incomplete proteins.4. Describe the products formed by complete hydrolysis of proteins.5. Describe the chemical agents used for the complete hydrolysis.
6. Understand that amino acid classification is based on their ionic properties at physiological pH.	<ol style="list-style-type: none">1. Explain how amino acids are classified.2. Distinguish between essential and nonessential amino acid.
7. Understand that protein structure is important to its	

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biological function.	<ol style="list-style-type: none"> 1. Describe the four levels of structure. Include the type and characteristics associated with each level of structure. 2. Explain denaturation of a protein. Include examples of aging responsible for denaturation and how this relates to function.
8. Understand the system of protein classification.	<ol style="list-style-type: none"> 1. Describe the classification of proteins based on their composition, shape, and function.
9. Understand that animals are dependent on plants or other animals for their source of dietary protein.	<ol style="list-style-type: none"> 1. Describe the nitrogen cycle, emphasizing the role played by microorganisms.
10. Understand chemical digestion of protein is a catabolic process in which dietary protein molecules are broken down into their monomers, amino acids.	<ol style="list-style-type: none"> 1. Trace the digestion of dietary proteins, include the proteolytic enzymes involved.
11. Understand the metabolism of proteins.	<ol style="list-style-type: none"> 1. Describe the absorption of amino acids. 2. Outline protein catabolism and anabolism in both the liver and tissues of the body. 3. Discuss the reactions of transamination and oxidative deamination.
12. Understand that enzymes are an important group of proteins.	<ol style="list-style-type: none"> 1. Describe the role of enzymes in a biochemical reaction.
13. Understand enzymes have unique characteristics and properties.	<ol style="list-style-type: none"> 1. Discuss the ability of enzymes to organize chemical reactions within the cell due to their specificity. 2. Describe how the uniqueness of its active site contributes

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<p>14. Understand how enzymes are named and classified according to the type of reaction each catalyzes.</p>	<p>to specificity.</p> <p>3. Discuss absolute and relative specificity. Describe the types of relative specificity.</p> <p>1. List the common enzyme types and discuss the distribution within a typical cell.</p> <p>2. Describe the International Classification of Enzymes.</p>
<p>15. Understand that many enzymes require a nonprotein component order to function.</p>	<p>1. Distinguish between simple and conjugated enzymes.</p> <p>2. Discuss the role of cofactors in many enzymatically-controlled reactions.</p> <p>3. Distinguish between activators and coenzymes.</p>
<p>16. Understand the role vitamins and minerals play as enzyme cofactors.</p>	<p>1. Distinguish between water an fat-soluble vitamins.</p> <p>2. Identify foods which serve as good sources of water and fat soluble vitamins.</p> <p>3. Identify foods which serve as good sources of minerals.</p>
<p>17. Understand the factors which influence the rate of an enzymatic reaction and, therefore, control metabolic processes.</p>	<p>1. Describe how the following influence the rate of enzyme reactions:</p> <ul style="list-style-type: none"> a. Concentration of enzyme b. Concentration of substrate c. Temperature d. PH e. Concentration of end product

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18. Understand that enzymatic activities must be controlled to ensure maintenance of homeostasis.	1. Discuss the role of the following in regulation of enzyme activity: <ol style="list-style-type: none"> a. Genetic control b. Allosteric enzymes c. Zymogens
19. Understand that inhibitors interfere with the action of an enzyme and block or slow the rate of a reaction.	1. Distinguish between irreversible and reversible inhibitors. 2. Distinguish between competitive and non-competitive inhibitors. Give specific examples of each type.
20. Understand the role of enzymes as indicators of disease.	1. List the isoenzymes used to indicate diseases and monitor progress of disease.
21. Understand that carbohydrates are extremely important and abundant compounds in the biological world.	1. Understand that light energy is converted into chemically useful energy by green plants: Photosynthesis. 2. List the components of a carbohydrate. 3. Draw the structure of an aldohexose and a ketohexose. 4. Discuss the properties of a carbohydrate. 5. Write the structure of a monosaccharide. 6. Draw a glycoside bond using glucose and lactose. 7. Distinguish between monosaccharides, disaccharides, and polysaccharides: Include examples. 8. Discuss the importance of maltase, sucrase, and lactase. 9. Distinguish between glycogenesis, glycogenolysis, and glyconeogenesis.
22. Understand the expenditure of energy through mechanical	1. Describe how energy is transferred to special energy-

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<p>work and biochemical reaction requires that organisms have available a constant supply of energy.</p>	<p>carrying molecules: Adenosine triphosphate.</p>
<p>23. Understand that carbohydrates supply approximately 50% of the total calories or energy value.</p>	<ol style="list-style-type: none"> 2. Describe the glycolytic pathway. 3. Discuss the formation of lactic acid and oxygen debt. 4. Describe the Krebs' cycle. 5. Discuss the production of carbon dioxide in the Krebs' cycle. 6. Describe the electron transport system or oxidative phosphorylation. 7. Discuss the role of oxygen in the electron transport system.
<p>24. Understand the importance of maintaining the blood glucose level.</p>	<ol style="list-style-type: none"> 1. List the sources of dietary carbohydrates. 2. Discuss the digestion of starch and/or glycogen. 3. List and give the origin of carbohydrate digestive enzyme. 4. Describe the absorption and transport of monosaccharides.
<p>25. Understand that lipids are a chemically diverse group of organic compounds essential to life.</p>	<ol style="list-style-type: none"> 1. Describe the hormonal mechanisms which are responsible for maintaining the blood glucose level. 2. Discuss diabetes mellitus and adrenal gland malfunctioning. <ol style="list-style-type: none"> 1. List and describe the functions of lipids. 2. Discuss the properties and characteristics of lipids. 3. Describe how lipids are classified. 4. Draw the structure of a typical fatty acid, i.e. stearic. 5. Distinguish between saturated and unsaturated fatty acids.

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