

# **Biology II**

## **A Model Course Guideline**

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# Biology II

## Course Description

Biology II is designed for the student who has a strong interest in biology. Students explore advanced topics selected from cellular biology, biochemistry, biotechnology, genetics, microbiology, evolution, behavior, ecology, plant and animal anatomy, and physiology. Research and advanced laboratory techniques are emphasized.

## CONTENT OUTLINE

- I. Research Skills
  - A. Experimental Design
  - B. Statistical Analysis of Results
  - C. Use of Scientific Literature
- II. Cellular Biology and Biochemistry
  - A. Eukaryotic vs. Prokaryotic Cells
  - B. Cell Respiration: Glycolysis and Krebs' Cycle
  - C. Photosynthesis: Photolysis and Carbon Dioxide Fixation
  - D. Enzyme Kinetics
- III. Genetics and Biotechnology
  - A. Modes of Inheritance
  - B. Control of Gene Action
  - C. Recombinant DNA
  - D. DNA Fingerprinting
- IV. Evolution
  - A. Evidence for Evolution
  - B. Mechanisms for Evolution
  - C. Speciation
  - D. Human Evolution
- V. Microbiology
  - A. Bacterial Physiology
  - B. Viral Structure and Replication

- C. Microbial Diseases
- VI. Behavior
  - A. Innate Components of Behavior
  - B. Learned Behavior
  - C. Interactive Behaviors
- VII. Ecology
  - A. Population Ecology
  - B. Population Interactions
  - C. Human Impact on Ecosystems
- VIII. Plant Anatomy and Physiology
  - A. Nutritional Requirements
  - B. Plant Hormones
  - C. Bioclocks in Plants
- IX. Animal Anatomy and Physiology
  - A. Nutrient Supply
  - B. Gas Exchange
  - C. Transport of Materials
  - D. Control Systems: Nervous and Endocrine Systems
  - E. Reproduction
  - F. Body Defenses
  - G. Biomechanics Skeletal and Muscular Systems

## Model Curriculum Guidelines

<b>Biology II</b>	
<b>TOPICS</b>	<b>BENCHMARKS</b>
<p><b>I. Research Skills</b></p> <p><b>A. Experimental Design</b></p> <ol style="list-style-type: none"> <li>1. Review how to formulate hypotheses and design appropriate experiments</li> <li>2. Design and carry out experiments on a variety of topics</li> </ol> <p><b>B. Statistical Analysis of Results</b></p> <ol style="list-style-type: none"> <li>1. Review the laws of probability</li> <li>2. Analyze self-generated experimental results using the Chi-square and T-test tests of significance</li> </ol> <p><b>C. Use of the Scientific Literature</b></p> <ol style="list-style-type: none"> <li>1. Demonstrate an ability to do a literature search</li> <li>2. Read and evaluate selected research papers</li> </ol>	<p>SI-H-A1 through A7 SI-H-B1, B2, B4, B5</p>
<p><b>II. Cellular Biology and Biochemistry</b></p> <p><b>A. Eukaryotic vs. Prokaryotic Cells</b></p> <ol style="list-style-type: none"> <li>1. Compare the two cell types</li> <li>2. Describe the current theories regarding the origin of eukaryotic organelles</li> </ol> <p><b>B. Cell Respiration</b></p> <ol style="list-style-type: none"> <li>1. Recognize the reactants and products of glycolysis</li> <li>2. Summarize the major steps in the Krebs's Cycle</li> <li>3. Describe the electron transport system</li> <li>4. Contrast the energy output of aerobic and anaerobic respiration</li> </ol> <p><b>C. Photosynthesis</b></p> <ol style="list-style-type: none"> <li>1. Describe the interaction between chlorophyll and photolysis</li> <li>1. Recognize the reactants, products, and functions of carbon dioxide fixation</li> </ol>	<p>LS-H-A1 LS-H-E1 + E2</p> <p>PS-H-D6</p>

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<p>D. Enzyme Kinetics</p> <ol style="list-style-type: none"> <li>1. Recognize the significance of enzyme specificity and active sites</li> <li>2. Discuss the impact of cofactors and coenzymes on enzyme functioning</li> <li>3. Experimentally investigate the optimal conditions for a selected enzyme</li> <li>4. Compare the different mechanisms of enzyme inhibition</li> </ol>	PS-H-C3, C6
<p>III. Genetics and Biotechnology</p> <p>A. Modes of Inheritance</p> <ol style="list-style-type: none"> <li>1. Review basic genetics and protein synthesis</li> <li>2. Experimentally analyze the inheritance of one trait in a selected organism such as the fruit fly</li> </ol> <p>B. Control of Gene Expression</p> <ol style="list-style-type: none"> <li>1. Recognize examples of the operon model in prokaryotes</li> <li>2. Describe the of gene control in eukaryotes</li> </ol> <p>C. Recombinant DNA</p> <ol style="list-style-type: none"> <li>1. Describe the techniques used to product recombinant DNA</li> <li>2. Discuss the impact of recombinant DNA in medicine and agriculture</li> </ol> <p>D. DNA Fingerprinting</p> <ol style="list-style-type: none"> <li>1. Demonstrate an ability to interpret DNA fingerprints</li> <li>2. Carry out a DNA extraction and/or produce a DNA fingerprint using gel electrophoresis</li> <li>2. Describe the importance of DNA analysis in forensics</li> </ol>	<p>LS-H-A3 LS-H-B1, B3, B4</p> <p>LS-H-B4</p> <p>LS-H-B4</p>
<p>IV. Evolution</p> <p>A. Evidence for Evolution</p> <ol style="list-style-type: none"> <li>1. Describe the evidence from the fossil record, homology, and comparative embryology</li> <li>2. Use comparative embryology as evidence evolving species and to demonstrate how the species are related</li> </ol>	<p>LS-H C2,C3</p> <p>LS-H-A3</p>



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<b>TOPICS</b>	<b>BENCHMARKS</b>
<p>VII. Ecology</p> <ul style="list-style-type: none"> <li>A. Population Ecology</li> <li>B. Population Interactions</li> <li>C. Human Impact on Ecosystems</li> </ul> <p>VIII. Plant Anatomy and Physiology</p> <ul style="list-style-type: none"> <li>A. Nutritional Requirements</li> <li>B. Plant Hormones</li> <li>C. Bioclocks in Plants</li> </ul>	<p>LS-H-D1, D2, LS-H-D3,D4</p>
<p>IX. Animal Anatomy and Physiology</p> <ul style="list-style-type: none"> <li>A. Nutrient Supply</li> <li>B. Gas Exchange</li> <li>C. Transport of Materials</li> <li>D. Control Systems <ul style="list-style-type: none"> <li>1. Nervous system.</li> <li>2. Endocrine system.</li> </ul> </li> <li>E. Reproduction</li> <li>F. Body Defenses</li> <li>G. Biomechanics</li> </ul>	<p>LS-H-F1,F2</p>

## Acknowledgements

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