

**LYNN ENGLISH HIGH SCHOOL SCIENCE DEPARTMENT
AP BIOLOGY CURRICULUM**

STANDARDS/TOPIC	LEARNING OBJECTIVES	RESOURCES	ASSESSMENT
<p style="text-align: center;"><i>AP TOPIC/CONTENT</i></p> <p>I. Molecules and Cells A. Chemistry of Life</p> <ul style="list-style-type: none"> • Atoms & Molecules • Elements & Compounds <p>MASSACHUSETTS STANDARDS 1. The Chemistry of Life</p> <p><i>Broad Concept:</i> Chemical elements form organic molecules that interact to perform the basic functions of life.</p> <p style="text-align: center;">1.1</p> <p style="text-align: center;">BASIC CHEMISTRY</p> <ul style="list-style-type: none"> • Recognize that biological organisms are composed primarily of very few elements. • The six most common are C, H, N, O, P, S. 	<p>Students will be able to:</p> <ol style="list-style-type: none"> 1. Define <i>element, atom, compound, and molecule.</i> 2. Draw a model of the structure of an atom. 3. Explain how an elements properties depend on the structure of its atom.. 4. Explain how chemical bonding between atoms is dependent on formation and function of molecules. 5. Contrast ionic and covalent bonds. 6. Describe weak bonds and Van der Waals interactions. 7. Explain how chemical reactions make and break chemical bonds. 	<p>TEXT: <u><i>Biology, Seventh Edition, by Campbell and Reece</i></u></p> <p>Reading: Chapter 2: Chemical Context of Life</p> <p>Lecture Notes: Chapter 2 Notes. Chemistry PPT Periodic Table of Elements.</p> <p>Labs/Activities Making Models Adopt an Element</p> <p>Homework:</p> <ul style="list-style-type: none"> • Concept Checks • Testing Your Knowledge 	<p>Chapter 2 Assessment</p> <p>Collins: pH</p> <p>AP Lab report</p> <p>Lab rubric</p> <p>Homework Rubric</p> <p>School Wide Rubric</p>

STANDARDS/TOPIC	LEARNING OBJECTIVES	RESOURCES	ASSESSMENT
<p>AP BIOLOGY TOPIC/CONTENT</p> <p>I. Molecules and Cells</p> <p>A. The Chemistry of Life</p> <ul style="list-style-type: none"> • Properties of Water/Dissociation • Functional Groups • Carbon • Organic Molecules in organisms • Role of Enzymes • Free Energy Changes <p>MASSACHUSETTES STANDARDS</p> <p>1.2</p> <p>ORGANIC MOLECULES</p> <ul style="list-style-type: none"> • Describe the basic molecular structures and primary functions of the four major categories of organic molecules: <ul style="list-style-type: none"> • carbohydrates • lipids • proteins • nucleic acids 	<p>Students will be able to:</p> <ol style="list-style-type: none"> 1. Describe the structure of a water molecule. 2. Explain how water's polar nature affects its ability to dissolve substances. 3. List two of water's properties that result from hydrogen bonding. 4. Explain the four properties of water that contribute to life on Earth. 5. Describe the process of dissociation of water and how it contributes to acidic and basic conditions. 6. Explain the role of buffers and how they work. 7. Define <i>organic compounds</i> and name three elements often found in organic compounds. 8. Explain the structure of carbon and why carbon forms so many different compounds. 9. Define <i>functional group</i> and explain its significance. 10. Describe the major functional groups and their properties. 11. Explain how energy is released from ATP. 12. Compare a condensation reaction with hydrolysis. 13. Define <i>monosaccharide, disaccharide, and polysaccharide</i>, and discuss their significance to organisms. 14. Compare the structures of the various types of proteins. 15. Relate the structure of lipids to their functions. 16. Explain the structure and role of nucleic acids. 17. Describe how molecular comparisons help biologists make evolutionary connections. 	<p>TEXT: <i>Biology, Seventh Edition</i>, by Campbell and Reece</p> <p>Reading: Chapter 3 Properties of Water Chapter 4: Carbon Chapter 5: Macromolecules</p> <p>Warm-ups: AP Review</p> <p>Questions: Water, Carbon Macromolecules</p> <p>Lecture Notes: PPT: Properties of Water Notes: Carbon Carbon Compounds PPT Notes: Organic Compounds</p> <p>Labs/Activities:</p> <ul style="list-style-type: none"> • Constructing Organic Molecules • Collins Brainstorm <p>Homework:</p> <ul style="list-style-type: none"> • Concept Checks • Testing Your Knowledge 	<ul style="list-style-type: none"> • Chapters 3-5 Assessment • AP Practice Questions • Lab reports • Lab rubric • Homework Rubric • School Wide Rubric • AP Lab Report

STANDARDS/TOPIC	LEARNING OBJECTIVES	RESOURCES	ASSESSMENT
<p style="text-align: center;">AP BIOLOGY TOPIC</p> <p>I. Molecules and Cells</p> <p>B. Cells</p> <ol style="list-style-type: none"> 1. Prokaryotic and Eukaryotic Cells 2. Membranes 3. Subcellular Organization 4. Cell Cycle and It's regulation <p style="text-align: center;">MASSACHUSETTS STANDARDS</p> <p>2. Cell Biology Broad Concept: Cells have specific structures and functions that make them distinctive. Processes in a cell can be classified broadly as growth, maintenance, and reproduction</p> <p style="text-align: center;">2.1</p> <p>CELL STRUCTURE AND FUNCTION</p> <ul style="list-style-type: none"> ▪ <u>Relate cell parts/organelles</u> –(plasma membrane, nuclear envelope, nucleus, nucleolus, cytoplasm, mitochondrion, endoplasmic reticulum, Golgi apparatus, lysosome, ribosome, vacuole, cell wall, chloroplast, cytoskeleton, centriole, cilium, flagellum, pseudopod) <u>to their functions.</u> ▪ Explain the role of cell membranes as a highly selective barrier (diffusion, osmosis, facilitated diffusion, and active transport). <p style="text-align: center;">2.2</p> <p>PROKARYOTES/EUKARYOTES</p> <ul style="list-style-type: none"> ▪ Compare and contrast, at the cellular level, prokaryotes and eukaryotes (general structures and degrees of complexity). 	<p>Students will be able to:</p> <ol style="list-style-type: none"> 1. Outline the discoveries that led to the development of the cell theory. 2. State the cell theory. 3. Identify a limiting factor on the size of cells. 4. Describe the relationship between cell shape and cell function. 5. Distinguish between prokaryotes and eukaryotes. 6. Describe the structure, composition, and function of the cell membrane. 7. Name the major organelles found in a eukaryotic cell, and describe their functions. 8. Describe the structure and function of the nucleus. 9. Describe three structures characteristic of plant cells. 10. Name two types of autotrophy and explain the difference between them. 11. Explain how photosynthesis and aerobic respiration are thought to be related. 12. Define <i>endosymbiosis</i>, and explain why it is important in the history of eukaryotes. 13. Distinguish between tissues, organs, and organ systems. 14. Describe the features of a colonial organism 	<p>TEXT: <u>Biology, Seventh Edition</u>, by Campbell and Reece</p> <p>Reading: Chapter 6: Tour of the Cell</p> <p>Warm-ups: AP Review Questions: Cells</p> <p>Lecture Notes: Chapter 6: The Cell Notes Cell Overview PPT Tour of The Cell PPT Cells Alive WEBSITE Cell Organelles PPT Amazing Cell Video</p> <p>Labs/Activities</p> <ul style="list-style-type: none"> • Cell Web Quest GO • Cell Analogy Project • Cell Analogy Collage • Cell Model • Lab: Observing Specialized Cells • Project: Cell Theory Timeline <p>Homework:</p> <ul style="list-style-type: none"> • Concept Checks • Testing Your Knowledge • Read Chapter 	<p>Collins: Comparing and Contrasting Prokaryotic and Eukaryotic Cells</p> <p>Collins: Comparing and Contrasting Plant and Animal Cells</p> <p>Collins: Compare and Contrast 2 cell organelles</p> <p>Chapter 6 Assessment</p> <p>Lab reports</p> <p>Lab rubric</p> <p>Homework Rubric</p> <p>School Wide Rubric</p>

STANDARDS/TOPIC	LEARNING OBJECTIVES	RESOURCES	ASSESSMENT
<p><i>AP TOPIC/CONTENT</i></p> <p>B. Cells</p> <p>1. Membranes</p> <ul style="list-style-type: none"> • Osmosis/Diffusion • Active transport • Bulk transport <p>MASSACHUSETTS STANDARDS</p> <p>2. Cell Biology</p> <p style="padding-left: 40px;">2.1</p> <p style="padding-left: 80px;">CELL TRANSPORT</p> <p>▪ Explain the role of cell membranes as a highly selective barrier (diffusion, osmosis, facilitated diffusion, and active transport).</p>	<p>Students will be able to:</p> <ol style="list-style-type: none"> 1. Describe the fluid mosaic structure of the cell membrane. 2. Explain the role of integral and peripheral proteins. 3. Explain the structure of the cell membranes leads to its property of selective permeability. 4. Describe types of passive transport: <ul style="list-style-type: none"> • Osmosis • Diffusion • Facilitated diffusion 5. Describe types of active transport: <ul style="list-style-type: none"> • Ion pumps • Cotransport 6. Describe bulk transport: <ul style="list-style-type: none"> • Exocytosis • Endocytosis 	<p>TEXT: <i>Biology, Seventh Edition, by Campbell and Reece</i></p> <p>Reading: Chapter 7: Membrane Structure and Function</p> <p>Warm-ups: Review Questions</p> <p>Lecture Notes: Homeostatis and Cell Transport Notes BiologyZone Homeostasis and Transport PPT Cell Transport Power Point</p> <p>Labs/Activities <i>AP Lab #1: Diffusion and Osmosis</i></p> <ul style="list-style-type: none"> • Cell Membrane Models <p>Homework:</p> <ul style="list-style-type: none"> • Transport Graphic Organizer • Concept Checks • Testing Your Knowledge • Read Chapter 	<p>Collins: Diffusion and Osmosis Lab Report</p> <p>Chapter 7 Test</p> <p>Lab report</p> <p>Lab rubric</p> <p>Homework Rubric</p> <p>School Wide Rubric</p>

STANDARDS/TOPIC	LEARNING OBJECTIVES	RESOURCES	ASSESSMENT
<p style="text-align: center;"><i>AP TOPIC/CONTENT</i></p> <p>B. Cells</p> <p>1. Metabolism</p> <ul style="list-style-type: none"> • Free energy • ATP • Enzymes <p>MASSACHUSETTES STANDARDS</p> <p style="text-align: center;">ENZYMES</p> <p style="text-align: center;">1.3</p> <ul style="list-style-type: none"> • Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. • Identify factors, such as pH and temperature, which have an effect on enzymes. <p style="text-align: center;">ATP</p> <p style="text-align: center;">2.5</p> <ul style="list-style-type: none"> • Explain the important role that ATP serves in metabolism 	<p>Students will be able to:</p> <ol style="list-style-type: none"> 1. Explain the role of catabolic and anabolic pathways in cellular metabolism. 2. Distinguish between kinetic and potential energy. 3. Explain why an organism is considered an open system. 4. Explain the first and second laws of thermodynamics in your own words. 5. Explain why highly ordered living organisms do not violate the second law of thermodynamics. 6. Write and define each component of the equation for free-energy change. 7. Distinguish between exergonic and endergonic reactions in terms of free energy change. 8. Explain why metabolic disequilibrium is one of the defining features of life. 9. Describe the structure of ATP and identify the major class of macromolecules to which ATP belongs. 10. Explain how ATP performs cellular work. 11. Describe the function of enzymes in biological systems. 12. Explain how enzyme structure determines enzyme specificity. 13. Explain the induced-fit model of enzyme function. 14. Describe the mechanisms by which enzymes lower activation energy. 15. Explain how substrate concentration affects the rate of an enzyme-catalyzed reaction. 16. Explain how temperature, pH, cofactors, and enzyme inhibitors can affect enzyme activity. 	<p>TEXT: <u>Biology, Seventh Edition, by Campbell and Reece</u></p> <p>Reading: Chapter 8: Metabolism</p> <p>Lecture Notes: Energy of Life Intro to Metabolism PPT</p> <p>Labs/Activities <i>AP Lab #2: Enzyme Catalysis</i></p> <p>Homework:</p> <ul style="list-style-type: none"> • Concept Checks • Testing Your Knowledge • Read Chapter 	<p>Chapter 8 Assessment</p> <p>Lab report</p> <p>Lab rubric</p> <p>Homework Rubric</p> <p>School Wide Rubric</p>

STANDARDS/TOPIC	LEARNING OBJECTIVES	RESOURCES	ASSESSMENT
<p><i>AP TOPIC/CONTENT</i></p> <p>C. Cell Energetics</p> <ul style="list-style-type: none"> • Coupled reactions • Fermentation • Cellular respiration <p>MASSACHUSETTES STANDARDS</p> <p>2.4</p> <ul style="list-style-type: none"> • Identify the reactants, products, and basic purposes of photosynthesis and cellular respiration. • Explain the interrelated nature of photosynthesis and cellular respiration in the cells of photosynthetic organisms. 	<p>Students will be able to:</p> <ol style="list-style-type: none"> 1. Define <i>cellular respiration</i>. 2. Describe the major events in glycolysis. 3. Compare and contrast lactic acid fermentation and alcoholic fermentation. 4. Calculate the efficiency of glycolysis. 5. Summarize the events of the Krebs cycle. 6. Summarize the events of the electron transport chain. 7. Relate aerobic respiration to the structure of a mitochondrion. 8. Calculate the efficiency of aerobic respiration. 9. Describe the molecule ATP, what it is composed of. 10. Explain oxidative phosphorylation. 	<p>TEXT: <u>Biology</u>, <i>Seventh Edition</i>, by Campbell and Reece</p> <p>Reading: Chapter 9: Cell Respiration</p> <p>Warm-ups: AP Review Questions</p> <p>Lecture Notes: <i>AP LAB #5: Cell Respiration</i> Cell Respiration Notes BiologyZone Cell Respiration PPT PH Cell Respiration Concepts</p> <p>Labs/Activities</p> <ul style="list-style-type: none"> • Cell Respiration Worksheet • Chemiosmosis Drawing • Cell Respiration Graphic Organizers <p>Homework:</p> <ul style="list-style-type: none"> • Concept Checks • Testing Your Knowledge • Read Chapter 	<p>Chapter 9 Assessment</p> <p>AP Lab report</p> <p>Lab rubric</p> <p>Performance Assessment: Respiration Cards</p> <p>Homework Rubric</p> <p>School Wide Rubric</p>

STANDARDS/TOPIC	LEARNING OBJECTIVES	RESOURCES	ASSESSMENT
<p><i>AP TOPIC/CONTENT</i></p> <p>D. Cell Energetics</p> <ul style="list-style-type: none"> • Photosynthesis <p>MASSACHUSETTS STANDARDS</p> <p>2.4</p> <p>CELL RESPIRATION</p> <ul style="list-style-type: none"> • Identify the reactants, products, and basic purposes of photosynthesis and cellular respiration. • Explain the interrelated nature of photosynthesis and cellular respiration in the cells of photosynthetic organisms. <p>2.5</p> <ul style="list-style-type: none"> • Explain the important role that ATP serves in metabolism 	<p>Students will be able to:</p> <ol style="list-style-type: none"> 1. Explain how the structure of the chloroplast relates to its function. 2. Describe the role of chlorophylls and other pigments in photosynthesis. 3. Explain how light reactions convert solar energy to chemical energy ATP and NADPH. 4. Summarize main events of electron transport. 5. Describe what happens to a water molecule in photosynthesis. 6. Explain how ATP is synthesized during the light reactions. 7. Explain how the Calvin cycle uses ATP and NADPH to convert CO₂ to sugar. 8. Describe what happens to the compounds made in the Calvin cycle. 9. Distinguish between C₃, C₄, and CAM plants. 10. Explain how environmental factors influence photosynthesis. 	<p>TEXT: <u>Biology, Seventh Edition, by Campbell and Reece</u></p> <p>Reading: Chapter 10: Photosynthesis</p> <p>Lecture Notes: MB Structure of Chloroplasts ppt Photosynthesis notes from Web Photosynthesis Powerpoint Photosynthesis Overview</p> <p>Labs/Activities <i>AP Lab #4: Plant Pigments and Photosynthesis</i></p> <ul style="list-style-type: none"> • Photosynthesis Worksheet • Photosynthesis and Cell Respiration Review • Photosynthesis Colorings • Photosynthesis Cards <p>Homework:</p> <ul style="list-style-type: none"> • Concept Checks • Testing Your Knowledge • Read Chapter 	<p>Chapter 10 Assessment</p> <p>Lab reports</p> <p>Lab rubric</p> <p>Performance Assessment: Photo Cards</p> <p>Homework Rubric</p> <p>School Wide Rubric</p>

STANDARDS/TOPIC	LEARNING OBJECTIVES	RESOURCES	ASSESSMENT
<p style="text-align: center;"><i>AP TOPIC/CONTENT</i></p> <p>B. Cells</p> <ul style="list-style-type: none"> • Cell cycle and its regulation <p>II. Heredity and Evolution</p> <ul style="list-style-type: none"> • Meiosis and gametogenesis <p style="text-align: center;">2.6 MITOSIS</p> <ul style="list-style-type: none"> • Describe the cell cycle and the process of mitosis. • Explain the role of mitosis in the formation of new cells, and its importance in maintaining chromosome number during asexual reproduction. <p style="text-align: center;">2.7 MEIOSIS</p> <ul style="list-style-type: none"> • Describe how the process of meiosis results in the formation of haploid cells. • Explain the importance of this process in sexual reproduction, and how gametes form diploid zygotes in the process of fertilization. 	<p>Students will be able to:</p> <ol style="list-style-type: none"> 1. Describe the structure of a chromosome. 2. Compare prokaryotic chromosomes with eukaryotic chromosomes. 3. Explain the differences between sex chromosomes and autosomes. 4. Give examples of diploid and haploid cells. 5. Describe the events of binary fission. 6. Describe each phase of the cell cycle 7. Summarize the phases of mitosis. 8. Compare cytokinesis in animal cells with cytokinesis in plant cells. 9. List and describe the phases of meiosis. 10. Compare the end products of mitosis with those of meiosis. 11. Explain crossing-over and how it contributes to the production of unique individuals. 12. Summarize the major characteristics of spermatogenesis and oogenesis. 	<p>TEXT: <u>Biology</u>, <i>Seventh Edition</i>, by Campbell and Reece</p> <p>Reading: Chapter12: The Cell Cycle</p> <p>Warm-ups: AP Review Questions</p> <p>Lecture Notes: Cell Cycle PPT Cell Division Notes-Massengale Cell Growth and Division PPT Animal Cell Mitosis Plant Cell Mitosis</p> <p>Labs/Activities <i>AP Lab #3: Mitosis and Meiosis</i></p> <ul style="list-style-type: none"> • Mitosis/Meiosis drawings • Lab: Mitosis string • Computer Lab: Mitosis and Meiosis in Motion <p>Homework:</p> <ul style="list-style-type: none"> • Concept Checks • Testing Your Knowledge • Read Chapter 	<p>Collins: The Cell Cycle Chapter 12 Assessment</p> <p>Lab reports</p> <p>Lab rubric</p> <p>Homework Rubric</p> <p>School Wide Rubric</p>