

# *Wallenpaupack Area School District*

**COURSE:** Academic Biology

**GRADE LEVEL:** 9<sup>th</sup> and 10<sup>th</sup> Grade

**LENGTH OF COURSE:** 90 days/year

**TEXT:** Biology Science: A Molecular Approach. BSCS Blue Version, Seventh Edition

**PUBLISHER:** DC Health and Company

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**COURSE DESCRIPTION:**

This course is taught with emphasis on biological concepts. An inquiry-based, hands-on approach is used when appropriate. Topics include cellular, organismal, and environmental biology. This course is mainly for students who are planning to attend a 4 year college.

**CURRICULUM WRITING TEAM:**

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**DATE OF REVISION:**

2004

# Wallenpaupack Area School District

**Course:** Academic Biology

**Grade Level:** Grade 9 & 10

**Unit:** Scientific Process

**PA Standards:** 3.1.10.D  
3.2.10.A  
3.2.10.B  
3.2.10.C

Topics:	Skills:
<p>Unifying Themes Inquiry and Design</p>	<p>Convert one scale to another</p> <p>Apply knowledge and understanding about the nature of scientific and technological knowledge</p> <ul style="list-style-type: none"> <li>• Compare and contrast scientific theories and beliefs</li> <li>• Know that science uses both direct and indirect observation means to study the world and the universe</li> <li>• Integrate new information into existing theories and explain implied results</li> </ul> <p>Apply process knowledge and organize scientific and technological phenomena in varied ways</p> <ul style="list-style-type: none"> <li>• Describe materials using precise quantitative and qualitative skills based on observations</li> <li>• Develop appropriate scientific experiments: raising questions, formulating hypotheses, testing, controlled experiments, recognizing variables, manipulating variables, interpreting data, and producing solutions</li> <li>• Use process skills to make inferences and predictions using collected information and to communicate, using space/time relationships, defining operationally</li> </ul> <p>Apply the elements of scientific inquiry to solve problems</p> <ul style="list-style-type: none"> <li>• Generate questions about objects, organisms and/or events that can be answered through scientific investigations</li> <li>• Evaluate the appropriateness of questions</li> <li>• Design an investigation with adequate control and limited variables to investigate a question</li> <li>• Conduct a multiple step experiment</li> <li>• Organize experimental information using a variety of analytic methods</li> <li>• Judge the significance of experimental information in answering the question</li> <li>• Suggest additional steps that might be done experimentally</li> </ul>

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<b>Activities:</b>	<b>Performance Assessments:</b>
Concept map of subdivisions of science and biology Diving rod activity Analyzing ethical issues investigation Laserdisc slides and movies Microscope lab	Assignment evaluations Teacher observations Student performances on investigations and labs Notebook evaluations Exams

# Wallenpaupack Area School District

**Course:** Academic Biology

**Grade Level:** Grade 9 & 10

**Unit:** Life Processes

**PA Standards:** 3.1.10.A  
 3.1.10.B  
 3.1.10.C  
 3.1.10.E  
 3.3.10.A  
 3.3.10.B  
 3.3.10.C

<b>Topics:</b>	<b>Skills:</b>
<p>Unifying themes            Biological sciences</p>	<p>Discriminate among the concepts of systems, subsystems, feedback and control in solving technological problems</p> <ul style="list-style-type: none"> <li>• Identify the function of subsystems within a larger system</li> </ul> <p>Describe concepts of models as a way to predict and understand science and technology</p> <ul style="list-style-type: none"> <li>• Distinguish between different types of models and modeling techniques and apply their appropriate use in specific</li> <li>• Examine the advantages of using models to demonstrate processes and outcomes</li> <li>• Apply mathematical models to science and technology</li> </ul> <p>Apply patterns as repeated processes or recurring elements in science and technology</p> <ul style="list-style-type: none"> <li>• Examine and describe recurring patterns that form the basis of biological classification, chemical periodicity, geological order and astronomical order</li> </ul> <p>Describe patterns of change in nature, physical and man made systems</p> <ul style="list-style-type: none"> <li>• Describe how fundamental science and technology concepts are used to solve practical problems</li> <li>• Recognize that stable systems often involve underlying dynamic changes</li> <li>• Describe the effects of error in measurements</li> </ul> <p>Explain the structural and functional similarities and differences found among living things</p>

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	<p><b>Skills: (continued)</b></p> <ul style="list-style-type: none"> <li>• Explain the relationship between structure and function at the molecular and cellular levels</li> </ul> <p>Describe and explain the chemical and structural basis of living organisms</p> <ul style="list-style-type: none"> <li>• Describe the relationship between the structure of organic molecules and the function they serve in living organisms</li> <li>• Identify the specialized structures and regions of the cell and the functions of each</li> <li>• Explain how cells store and use information to guide their functions</li> <li>• Explain cell functions and processes in terms of chemical reactions and energy changes</li> </ul> <p>Describe how genetic information is inherited and expressed</p> <ul style="list-style-type: none"> <li>• Compare and contrast the function of mitosis and meiosis</li> <li>• Describe mutations' effects on trait's expressions</li> <li>• Distinguish different reproductive patterns in living things (e.g., budding, spores, fission)</li> <li>• Explain the relationship among DNA, genes and chromosomes</li> </ul> <p>Describe the role of DNA in protein synthesis as it relates to gene expression</p>
<p><b>Activities:</b></p> <p>Fast plant growth lab          Laser disc clips          Candle activity          Is it alive? activity          Microscope use          Cell structure lab          Cell coloring activity          Diffusion-osmosis activities          Homeostasis lab (elodea and potatoes)          Photosynthesis Lab          Respiration and fermentation lab          DNA and protein synthesis models          Videos          Cell type introduction activity          Food label analysis lab          Surface area to volume lab          Computer assisted instruction          Textbook readings and questions          Plant tissue lab</p>	<p><b>Performance Assessments:</b></p> <p>Assignment evaluations          Teacher observations          Student performances on investigations and labs          Exams</p>

# Wallenpaupack Area School District

**Course:** Academic Biology

**Grade Level:** Grade 9 & 10

**Unit:** Genetics and Biotechnology

**PA Standards:** 3.1.10.B  
3.3.10.C  
3.3.12.C

<b>Topics:</b>	<b>Skills:</b>
<p>Biological sciences Unifying themes</p>	<p>Describe how genetic information is inherited and expressed</p> <ul style="list-style-type: none"> <li>• Describe mutations' effects on trait's expression</li> <li>• Distinguish different reproductive patterns in living things (e.g., budding, spores, fission)</li> <li>• Explain the relationship among DNA, genes and chromosomes</li> <li>• Explain different types of inheritance (e.g., multiple allele, sex-influenced traits)</li> </ul> <p>Explain gene inheritance and expression at the molecular level</p> <ul style="list-style-type: none"> <li>• Analyze gene expression at the molecular level</li> <li>• Describe the roles of nucleic acids in cellular reproduction and protein synthesis</li> <li>• Describe genetic engineering techniques, applications and impacts</li> </ul> <p>Explain birth defects from the standpoint of embryological development and/or changes in genetic makeup</p> <p>Describe concepts of models as a way to predict and understand science and biology</p> <ul style="list-style-type: none"> <li>• Examine the advantages of using models to demonstrate process and outcomes</li> </ul> <p>Apply patterns as repeated processes or recurring elements in science and biology</p> <ul style="list-style-type: none"> <li>• Examine and describe recurring patterns that form the basis of biological classification, chemical, periodicity, geological order and astronomical order</li> </ul>

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<b>Activities:</b>	<b>Performance Assessments:</b>
Laser disc Videos Marshmallow meiosis Human face variations activity Genetics problems Computer assisted instruction Pedigree analysis DNA fingerprinting lab Blood typing activity DNA extraction lab Genetic disorder research Textbook readings and questions	Assignment evaluations Teacher observations Student performances on investigations and labs Exams

# Wallenpaupack Area School District

**Course:** Academic Biology

**Grade Level:** Grade 9 & 10

**Unit:** Embryology and Reproduction

**PA Standards:** 3.3.10.C  
3.3.12.C

<b>Topics:</b> Biological sciences	<b>Skills:</b> Describe how genetic information is inherited and expressed <ul style="list-style-type: none"><li>• Explain the relationship among, DNA, genes and chromosomes</li></ul> Explain gene inheritance and expression at the molecular level <ul style="list-style-type: none"><li>• Explain birth defects from the standpoint of embryological development and/or changes in genetic makeup</li></ul>
<b>Activities:</b> Medaka fish observations First nine months pamphlet Laser disc Videos Textbook readings and questions	<b>Performance Assessments:</b> Assignment evaluations Teacher observations Student performances on investigations and labs Exams

# Wallenpaupack Area School District

**Course:** Academic Biology

**Grade Level:** Grade 9 & 10

**Unit:** Evolution and Adaptations

**PA Standards:** 3.2.10.A  
3.3.10.C  
3.3.10.D  
3.3.12.D

<b>Topics:</b>	<b>Skills:</b>
<p>Inquiry and design Biological sciences</p>	<p>Apply knowledge and understanding about the nature of specific and technological knowledge</p> <ul style="list-style-type: none"> <li>• Compare and contrast scientific theories and beliefs</li> <li>• Know that science uses both direct and indirect observation means to study the world and the universe</li> <li>• Integrate new information into existing theories and explain implied results</li> </ul> <p>Describe how genetic information is inherited and expressed</p> <ul style="list-style-type: none"> <li>• Compare random and selective breeding practices and their results (e.g., antibiotic resistant bacteria)</li> </ul> <p>Explain the mechanisms of the theory of evolution</p> <ul style="list-style-type: none"> <li>• Analyze data from fossil records, similarities in anatomy and physiology, embryological studies and DNA studies that are relevant to the theory of evolution</li> <li>• Explain the role of mutations and gene recombination in changing a population of organisms</li> <li>• Compare modern day descendants of extinct species and propose possible scientific accounts for their present appearance</li> <li>• Describe the factors (e.g., isolation, differential reproduction) affecting gene frequency in a population over time and their consequences</li> <li>• Describe and differentiate between the roles of natural selection and genetic drift</li> <li>• Explain why natural selection can act only on inherited traits</li> <li>• Apply the concept of natural selection to illustrate and account for a species' survival, extinction or change over time</li> </ul>

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	<p><b>Skills: (continued)</b></p> <p>Analyze the theory of evolution</p> <ul style="list-style-type: none"> <li>• Examine human history by describing the progression from early hominids to modern humans</li> </ul> <p>Apply the concept of natural selection as a central concept in illustrating evolution theory</p>
<p><b>Activities:</b></p> <p>Laser disc  Videos (Black Bear)  Primate evolution activity  Protein sequence comparison activity  Natural selection activities  Geologic time string activity  Textbook readings and questions  Evolution/adaptation video</p>	<p><b>Performance Assessments:</b></p> <p>Assignment evaluations  Teacher observations  Student performances on investigations and labs  Exams</p>

# Wallenpaupack Area School District

**Course:** Academic Biology

**Grade Level:** Grade 9 & 10

**Unit:** Taxonomy

**PA Standards:** 3.1.10.C  
3.3.10.A

<b>Topics:</b>	<b>Skills:</b>
<p>Unifying themes Biological sciences</p>	<p>Apply patterns as repeated processes or recurring elements in science and technology</p> <ul style="list-style-type: none"> <li>• Examine and describe recurring patterns that form the basis of biological classification, chemical periodicity, geological order and astronomical order</li> </ul> <p>Explain the structural and functional similarities and differences found among living things</p> <ul style="list-style-type: none"> <li>• Identify and characterize major life forms according to their placement in existing classification groups</li> <li>• Describe organizing schemes of classification keys</li> <li>• Identify and characterize major life forms by kingdom, phyla, class and order</li> </ul>
<b>Activities:</b>	<b>Performance Assessments:</b>
<p>Laser disc Dichotomous key activity Insect identification or tree identification activity Textbook readings and questions</p>	<p>Assignment evaluations Teacher observations Student performances on investigations and labs Notebook evaluations Exams</p>

# Wallenpaupack Area School District

**Course:** Academic Biology

**Grade Level:** Grade 9 & 10

**Unit:** Ecology

**PA Standards:** 3.7.10.B  
 4.1.10.A  
 4.1.10.B  
 4.1.10.C  
 4.1.10.D  
 4.1.10.E  
 4.3.10.B  
 4.4.10.B  
 4.6.10.A  
 4.7.10.A  
 4.7.10.B

<b>Topics:</b>	<b>Skills:</b>
<p>Watersheds and Wetlands            Environmental Health            Agriculture and Society            Ecosystems and their interactions            Threatened, endangered and extinct species            Technological Devices</p>	<p>Describe changes that occur from a stream's origin to its final outflow</p> <ul style="list-style-type: none"> <li>• Identify Pennsylvania's major watersheds and their related river systems</li> </ul> <p>Explain the relationship among landforms, vegetations and the amount and speed of water</p> <ul style="list-style-type: none"> <li>• Analyze a stream's physical characteristics</li> <li>• Describe how topography influences streams</li> <li>• Explain the influence of mountains on precipitation</li> <li>• Explain how vegetation affects storm water runoff</li> <li>• Delineate the boundaries of a watershed</li> <li>• Describe factors that affect the quality of groundwater</li> <li>• Explain how the speed of water and vegetation cover relates to erosion</li> </ul> <p>Describe the physical characteristics of a stream and determine the types of organisms found in aquatic environments</p> <ul style="list-style-type: none"> <li>• Describe and explain the physical factors that affect a stream and the organisms living there</li> <li>• Identify terrestrial and aquatic organisms that live in a watershed</li> <li>• Identify the types of organisms that would live in a stream based on the stream's physical characteristics</li> <li>• Explain the habitat needs of specific aquatic organisms</li> </ul>

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	<b>Skills: (continued)</b>
	<p>Describe the multiple functions of wetlands</p> <ul style="list-style-type: none"> <li>• Describe wetlands in terms of their effect (e.g., habitat, flood, buffer zones, prevention areas, nurseries, food production areas)</li> <li>• Explain how a wetland influences water quality, wildlife and water retention</li> <li>• Analyze wetlands through their indicators (e.g., soils, plants, hydrology)</li> </ul> <p>Identify and describe natural and human events on watersheds and wetlands</p> <ul style="list-style-type: none"> <li>• Describe how natural events affect a watershed (e.g., drought, floods)</li> <li>• Identify the effects of humans and human events on watersheds</li> </ul> <p>Explain how multiple variables determine the effects of pollution on environmental health, natural processes and human practices</p> <ul style="list-style-type: none"> <li>• Explain how human practices affect the quality of water and soil</li> </ul> <p>Assess the influence of agricultural science on farming practices</p> <ul style="list-style-type: none"> <li>• Analyze and explain the various practices on nutrient management on the farm</li> </ul> <p>Explain the biotic and abiotic components of an ecosystem and their interaction</p> <ul style="list-style-type: none"> <li>• Identify the major biomes and explain their similarities and differences</li> <li>• Compare and contrast the interactions of biotic and abiotic components in an ecosystem</li> <li>• Analyze the effects of abiotic factors on specific ecosystems</li> <li>• Describe how the availability of resource affects organisms in an ecosystem</li> <li>• Explain the concept of carrying capacity in an ecosystem</li> <li>• Explain trophic levels</li> <li>• Identify a specific environmental impact and predict what change may take place to affect homeostasis</li> <li>• Examine and explain how organisms modify their environments to sustain their needs</li> <li>• Assess the effects of latitude and altitude on biomes</li> <li>• Interpret possible causes of population fluctuations</li> </ul>

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	<p><b>Skills: (continued)</b></p> <p>Explain the significance of diversity in ecosystems</p> <ul style="list-style-type: none"> <li>• Explain the role that specific organisms have in their ecosystems</li> <li>• Identify a species and explain what affects its increase or decline might have on the ecosystem</li> <li>• Identify a species and explain how its adaptations are related to its niche in the environment</li> </ul> <p>Explain how structure, function and behavior of plants and animals affect their ability to survive</p> <ul style="list-style-type: none"> <li>• Describe an organism's adaptations for survival in its habitat</li> <li>• Compare adaptations among species</li> </ul> <p>Apply appropriate instruments and apparatus to examine a variety of objects and processes</p> <p>Describe and use appropriate instruments to gather and analyze data</p>
<p><b>Activities:</b></p>	<p><b>Performance Assessments:</b></p>
<p>Lake Wallenpaupack: A Resource Worth Protecting</p> <p>Guest speakers – careers</p> <p>Activity manual</p> <p>Activity binder</p> <p>Computer graph analysis</p> <p>GPS and GIS activities</p> <p>Fish sampling activities</p>	<p>Assignment evaluations</p> <p>Teacher observations</p> <p>Student performances on investigations and labs</p> <p>Exams</p>

# Wallenpaupack Area School District

**Course:** Academic Biology

**Grade Level:** Grade 9 & 10

**Unit:** Human Biology

**PA Standards:** 3.1.10.A  
3.3.12.A  
3.3.12.B

<b>Topics:</b>	<b>Skills:</b>
<p>Unifying themes Biological Sciences</p>	<p>Discriminate among the concepts of systems, subsystems, feedback and control in solving technological problems</p> <ul style="list-style-type: none"> <li>• Describe the interrelationships among inputs, processes, outputs, feedback and control in specific systems</li> <li>• Describe the interrelationships among inputs, processes, outputs, feedback and control in specific systems</li> </ul> <p>Explain the relationship between structure and function at all levels of organization</p> <ul style="list-style-type: none"> <li>• Explain and analyze the relationship between structure and function at the molecular, cellular and organ-system level</li> </ul> <p>Analyze the chemical and structural basis of living organisms</p> <ul style="list-style-type: none"> <li>• Evaluate relationships between structure and functions of different anatomical parts given their structure</li> </ul>
<b>Activities:</b>	<b>Performance Assessments:</b>
<p>Laser disc Frog dissection and alternative activities Comparative anatomy group research and poster Production Textbook readings and questions</p>	<p>Assignment evaluations Teacher observations Student performances on investigations and labs Exams</p>