

**WEST JEFFERSON HILLS SCHOOL DISTRICT
APPLIED BIOLOGY CURRICULUM**

GRADE 9

<p style="text-align: center;">PA Academic Standards Student must be able to do</p>	<p style="text-align: center;">Objective Content or process student will be able to know and do</p>	<p style="text-align: center;">Instructional Methods</p>	<p style="text-align: center;">Materials/ Resources Textbooks, trade books, workbooks, software, hardware, etc.</p>	<p style="text-align: center;">*Assessment Procedures *Additional adaptations, modifications, accommodations, and enrichment/ acceleration will be provided per IEP</p>	<p style="text-align: center;">*Additional Learning Opportunities for students who do not meet basic standards *Additional adaptations, modifications, and accommodations will be provided per IEP</p>	<p style="text-align: center;">*Extended Learning Opportunities for students who can go beyond the basic standards. *Additional enrichment/acceleration will be provided per IEP</p>
<p>3.2 Inquiry and Design</p>						
<p>A. Apply knowledge and understand about the nature of scientific and technological knowledge.</p>	<ul style="list-style-type: none"> • Compare and contrast scientific theories and beliefs. • Know that science uses both direct and indirect observation means to study the world and the universe. • Integrate new information into existing theories and explain implied results. • Explain how new information may change existing theories and practice. 	<ul style="list-style-type: none"> • Molecular Models • Direct Instruction • Partner Work • Group Work • Lab Work • Study Skills • Demonstrations (chemical) • Movie Clips • Graphing/ Analysis • Computer Projects • Cooperative Learning • Journal Writing • Guided/ Paired/ independent Reading • Brainstorming • Class discussions • Note guides • Dissections 	<ul style="list-style-type: none"> • Textbook/ Supplements • Transparencies • PowerPoint • Lab Manual Diagrams • Periodic Table • Calculators • Handouts Lab Equipment • Model Kits • Microscopes • Measuring Devices • Computer (classroom) • Computer (lab) • Excel • Preserved and Living Specimens • Chemicals • Videos • Testing Kits/materials • Internet • Magazines and Journals • Instructional CD's 	<ul style="list-style-type: none"> • Teacher Observation • Tests • Quizzes • Problem Solving • In-Class Work • Homework • Lab write-ups • Midterms • Final • Notebook check • Independent • Projects • Critical Thinking • Case Studies • Essays • Rubric • Peer Evaluation 	<ul style="list-style-type: none"> • Review and Re-teach • Small Group Instructions • Access to Learning Support Teachers • Adapted Lessons • Extended Time • Tutoring • Technology • Extended Time 	<ul style="list-style-type: none"> • Additional Reading • Science Competition • Science Fairs • Independent Projects • Field Trips • Science Clubs • Internships • Shadowing Programs

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3.2 Inquiry and Design						
B. Apply process knowledge and organize scientific and technological phenomena in varied ways.	<ul style="list-style-type: none"> • Describe materials using precise quantitative and qualitative skills based on observations. • Develop appropriate scientific experiments: raising questions, formulating hypotheses, testing, controlled experiments, recognizing variables, manipulating variables, interpreting data, and producing solutions. • Use process skills to make inferences and predictions using collected information and to communicate, using space/time relationships, defining operationally. • Measure materials using a variety of scales. 	<ul style="list-style-type: none"> • Molecular Models • Direct Instruction • Partner Work • Group Work • Lab Work • Study Skills • Demonstrations (chemical) • Movie Clips • Graphing/ Analysis • Computer Projects • Cooperative Learning • Journal Writing • Guided/ Paired/ independent Reading • Brainstorming • Class discussions • Note guides • Dissections 	<ul style="list-style-type: none"> • Textbook/ Supplements • Transparencies • PowerPoint • Lab Manual Diagrams • Periodic Table • Calculators • Handouts Lab Equipment • Model Kits • Microscopes • Measuring Devices • Computer (classroom) • Computer (lab) • Excel • Preserved and Living Specimens • Chemicals • Videos • Testing Kits/materials • Internet • Magazines and Journals • Instructional CD's 	<ul style="list-style-type: none"> • Teacher Observation • Tests • Quizzes • Problem Solving • In-Class Work • Homework • Lab write-ups • Midterms • Final • Notebook check • Independent • Projects • Critical Thinking • Case Studies • Essays • Rubric • Peer Evaluation 	<ul style="list-style-type: none"> • Review and Re-teach • Small Group Instructions • Access to Learning Support Teachers • Adapted Lessons • Extended Time • Tutoring • Technology • Extended Time 	<ul style="list-style-type: none"> • Additional Reading • Science Competition • Science Fairs • Independent Projects • Field Trips • Science Clubs • Internships • Shadowing Programs

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3.3 Biological Sciences						
A. Explain the structural and functional similarities and differences found among living things.	<ul style="list-style-type: none"> • Identify and characterize major life forms according to their placement in existing classification groups. • Explain the relationship between structure and function at the molecular and cellular levels. • Describe organizing schemes of classification keys. • Identify and characterize major life forms by kingdom, phyla, class and order. • Describe how the structures of living things help them function in unique ways. 	<ul style="list-style-type: none"> • Molecular Models • Direct Instruction • Partner Work • Group Work • Lab Work • Study Skills • Demonstrations (chemical) • Movie Clips • Graphing/ Analysis • Computer Projects • Cooperative Learning • Journal Writing • Guided/ Paired/ independent Reading • Brainstorming • Class discussions • Note guides • Dissections 	<ul style="list-style-type: none"> • Textbook/ Supplements • Transparencies • PowerPoint • Lab Manual Diagrams • Periodic Table • Calculators • Handouts Lab Equipment • Model Kits • Microscopes • Measuring Devices • Computer (classroom) • Computer (lab) • Excel • Preserved and Living Specimens • Chemicals • Videos • Testing Kits/materials • Internet • Magazines and Journals • Instructional CD's 	<ul style="list-style-type: none"> • Teacher Observation • Tests • Quizzes • Problem Solving • In-Class Work • Homework • Lab write-ups • Midterms • Final • Notebook check • Independent • Projects • Critical Thinking • Case Studies • Essays • Rubric • Peer Evaluation 	<ul style="list-style-type: none"> • Review and Re-teach • Small Group Instructions • Access to Learning Support Teachers • Adapted Lessons • Extended Time • Tutoring • Technology • Extended Time 	<ul style="list-style-type: none"> • Additional Reading • Science Competition • Science Fairs • Independent Projects • Field Trips • Science Clubs • Internships • Shadowing Programs

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<p>3.3 Biological Sciences</p>						
<p>A. Explain the structural and functional similarities and differences found among living things.</p>	<ul style="list-style-type: none"> • Account for adaptations among organisms that live in a particular environment. • Identify and explain interactions among organisms (e.g., mutually beneficial, harmful relationships). • Describe and explain structural and functional relationships in each of the five (or six) kingdoms. 	<ul style="list-style-type: none"> • Molecular Models • Direct Instruction • Partner Work • Group Work • Lab Work • Study Skills • Demonstrations (chemical) • Movie Clips • Graphing/ Analysis • Computer Projects • Cooperative Learning • Journal Writing • Guided/ Paired/ independent Reading • Brainstorming • Class discussions • Note guides • Dissections 	<ul style="list-style-type: none"> • Textbook/ Supplements • Transparencies • PowerPoint • Lab Manual Diagrams • Periodic Table • Calculators • Handouts Lab Equipment • Model Kits • Microscopes • Measuring Devices • Computer (classroom) • Computer (lab) • Excel • Preserved and Living Specimens • Chemicals • Videos • Testing Kits/materials • Internet • Magazines and Journals • Instructional CD's 	<ul style="list-style-type: none"> • Teacher Observation • Tests • Quizzes • Problem Solving • In-Class Work • Homework • Lab write-ups • Midterms • Final • Notebook check • Independent • Projects • Critical Thinking • Case Studies • Essays • Rubric • Peer Evaluation 	<ul style="list-style-type: none"> • Review and Re-teach • Small Group Instructions • Access to Learning Support Teachers • Adapted Lessons • Extended Time • Tutoring • Technology • Extended Time 	<ul style="list-style-type: none"> • Additional Reading • Science Competition • Science Fairs • Independent Projects • Field Trips • Science Clubs • Internships • Shadowing Programs

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3.3 Biological Sciences						
B. Describe and explain the chemical and structural basis of living organisms.	<ul style="list-style-type: none"> • Describe the relationship between the structure of organic molecules and the function they serve in living organisms. • Identify the specialized structures and regions of the cell and the functions of each. • Explain how cells store and use information to guide their functions. • Explain cell functions and processes in terms of chemical reactions and energy changes. • Identify the levels of organization from cell to organism. 	<ul style="list-style-type: none"> • Molecular Models • Direct Instruction • Partner Work • Group Work • Lab Work • Study Skills • Demonstrations (chemical) • Movie Clips • Graphing/ Analysis • Computer Projects • Cooperative Learning • Journal Writing • Guided/ Paired/ independent Reading • Brainstorming • Class discussions • Note guides • Dissections 	<ul style="list-style-type: none"> • Textbook/ Supplements • Transparencies • PowerPoint • Lab Manual Diagrams • Periodic Table • Calculators • Handouts Lab Equipment • Model Kits • Microscopes • Measuring Devices • Computer (classroom) • Computer (lab) • Excel • Preserved and Living Specimens • Chemicals • Videos • Testing Kits/materials • Internet • Magazines and Journals • Instructional CD's 	<ul style="list-style-type: none"> • Teacher Observation • Tests • Quizzes • Problem Solving • In-Class Work • Homework • Lab write-ups • Midterms • Final • Notebook check • Independent • Projects • Critical Thinking • Case Studies • Essays • Rubric • Peer Evaluation 	<ul style="list-style-type: none"> • Review and Re-teach • Small Group Instructions • Access to Learning Support Teachers • Adapted Lessons • Extended Time • Tutoring • Technology • Extended Time 	<ul style="list-style-type: none"> • Additional Reading • Science Competition • Science Fairs • Independent Projects • Field Trips • Science Clubs • Internships • Shadowing Programs

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3.3 Biological Sciences						
C. Describe how genetic information is inherited and expressed.	<ul style="list-style-type: none"> • Compare and contrast the function of mitosis and meiosis. • Describe mutations' effects on a trait's expression. • Distinguish different reproductive patterns in living things (e.g., budding, spores, fission). • Compare random and selective breeding practices and their results (e.g., antibiotic resistant bacteria). • Explain the relationship among DNA, genes and chromosomes. Explain different types of inheritance (e.g., multiple allele, sex-influenced traits). 	<ul style="list-style-type: none"> • Molecular Models • Direct Instruction • Partner Work • Group Work • Lab Work • Study Skills • Demonstrations (chemical) • Movie Clips • Graphing/ Analysis • Computer Projects • Cooperative Learning • Journal Writing • Guided/ Paired/ independent Reading • Brainstorming • Class discussions • Note guides • Dissections 	<ul style="list-style-type: none"> • Textbook/ Supplements • Transparencies • PowerPoint • Lab Manual Diagrams • Periodic Table • Calculators • Handouts Lab Equipment • Model Kits • Microscopes • Measuring Devices • Computer (classroom) • Computer (lab) • Excel • Preserved and Living Specimens • Chemicals • Videos • Testing Kits/materials • Internet • Magazines and Journals • Instructional CD's 	<ul style="list-style-type: none"> • Teacher Observation • Tests • Quizzes • Problem Solving • In-Class Work • Homework • Lab write-ups • Midterms • Final • Notebook check • Independent • Projects • Critical Thinking • Case Studies • Essays • Rubric Peer Evaluation 	<ul style="list-style-type: none"> • Review and Re-teach • Small Group Instructions • Access to Learning Support Teachers • Adapted Lessons • Extended Time • Tutoring • Technology • Extended Time 	<ul style="list-style-type: none"> • Additional Reading • Science Competition • Science Fairs • Independent Projects • Field Trips • Science Clubs • Internships • Shadowing Programs

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<p>3.3 Biological Sciences</p>						
	<ul style="list-style-type: none"> •Describe the role of DNA in protein synthesis as it relates to gene expression. •Identify and explain inheritable characteristics. •Identify that the gene is the basic unit of inheritance. •Describe how traits are inherited. •Distinguish how different living things reproduce (e.g., vegetative budding, sexual). •Recognize that mutations can alter a gene. •Describe how selective breeding, natural selection and genetic technologies can change genetic makeup of organisms. 					

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<p>3.3 Biological Sciences</p>						
	<ul style="list-style-type: none"> •Describe the roles of nucleic acids in cellular reproduction and protein synthesis. •Describe genetic engineering techniques, applications, and impact. •Explain birth defects from the standpoint of embryological development and/ or changes in genetic makeup. 					

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D. Explain the mechanisms of the theory of evolution.	<ul style="list-style-type: none"> •Analyze data from fossil records, similarities in anatomy and physiology, embryological studies and DNA studies that are relevant to the theory of evolution. •Explain the role of mutations and gene recombination in changing a population of organisms. •Compare modern day descendants of extinct species and propose possible scientific accounts for their present appearance. •Describe the factors (e.g., isolation, differential reproduction) affecting gene frequency in a population over time and their consequences. 	<ul style="list-style-type: none"> •Molecular Models •Direct Instruction •Partner Work •Group Work •Lab Work •Study Skills •Demonstrations (chemical) •Movie Clips •Graphing/ Analysis •Computer Projects •Cooperative Learning •Journal Writing •Guided/ Paired/ independent Reading •Brainstorming •Class discussions • Note guides • Dissections 	<ul style="list-style-type: none"> •Textbook/ Supplements •Transparencies •PowerPoint •Lab Manual Diagrams •Periodic Table •Calculators •Handouts Lab Equipment •Model Kits •Microscopes •Measuring Devices •Computer (classroom) •Computer (lab) •Excel •Preserved and Living Specimens •Chemicals •Videos •Testing Kits/materials •Internet •Magazines and Journals •Instructional CD's 	<ul style="list-style-type: none"> •Teacher Observation •Tests •Quizzes •Problem Solving •In-Class Work •Homework •Lab write-ups •Midterms •Final •Notebook check •Independent •Projects •Critical Thinking •Case Studies •Essays •Rubric •Peer Evaluation 	<ul style="list-style-type: none"> •Review and Re-teach •Small Group Instructions •Access to Learning Support Teachers •Adapted Lessons •Extended Time •Tutoring •Technology •Extended Time 	<ul style="list-style-type: none"> •Additional Reading •Science Competition •Science Fairs •Independent Projects •Field Trips •Science Clubs •Internships •Shadowing Programs

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<p>3.3 Biological Sciences</p>						
	<ul style="list-style-type: none"> •Describe changes that illustrate major events in the earth’s development based on a time line. •Explain why natural selection can act only on inherited traits. •Apply the concept of natural selection to illustrate and account for a species’ survival, extinction or change over time. •Describe the role that fossils play in studying the past. •Explain how biologic extinction is a natural process. •Apply the concept of natural selection as a central concept in illustrating evolution theory. 					