High School Biology

Unit Course Outline	Unit 1 Structure and Function (8 weeks)	Unit 2 Matter and Energy in Organisms and Ecosystems (5 weeks)	Unit 3 Interdependent Relationships in Ecosystems (7 weeks)	Unit 4 Inheritance and Variation of Traits (8 weeks)	Unit 5 Natural Selection and Evolution (7 weeks)
NGSS Disciplinary Core Ideas (DCI)	HS.LS1.A, HS.LS3.A, HS.ESS2.C	HS.LS1.C, HS.PS1.B, HS.PS2.B, HS.PS3.B, HS.PS3.D, HS.ESS2.A, HS.ESS2.D	HS.LS2.A, HS.LS2.D, HS.LS2.C, HS.ESS2.D, HS.ESS3.A, HS.ESS3.C, HS.ESS3.D	HS.LS1.A,HS. LS3.A, HS.LS3.B	HS.LS4.A, HS.LS4.C, HS.ESS1.C, HS.ESS3.B, HS.PS1.C, HS.ESS2.E
Performance Expectations	HS-LS1-1, HS-LS1-2, HS-LS1-3	HS-LS1-5, HS-LS1-6, HS-LS1-7, HS-LS2-5, HS-LS2-3, HS-LS2-4,	HS-LS2-8, HS-LS2-1, HS-LS2-6, HS-LS2-2, HS-LS2-7; HS-LS4-6	HS-LS1-4, HS-LS3-1, HS-LS1-1, HS-LS3-2, HS-LS3-3	HS-LS4-1, HS-LS4-3, HS-LS4-4, HS-LS2-6, HS-LS4-5, HS-LS4-2
Common Core Language Arts	RST.11- 12.1, WHST.9- 12.2 , WHST.9- 12.7, WHST.11- 12.8, WHST.9- 12.9, SL.11-12.5	RST.11-12.1, WHST.9- 12.2, WHST.9- 12.5, WHST.9- 12.9, SL.11-12.5	RST.9-10.8, RST.11- 12.1, RST.11- 12.7, RST.11- 12.8, WHST.9- 12.2, WHST.9-12.5, WHST.9- 12.7	RST.11-12.1, RST.11-12.9, WHST.9-12.1, SL.11-12.5	RST-11.12.1, RST-11.12.8, WHST.9-12.2, WHST.9-12.9, SL.11-12.4
Mathematics		MP.2 HSN-Q.A.1 HSN-Q.A.2 HSN-Q.A.3	MP.2 HSN-Q.A.1 HSN-Q.A.2 HSN-Q.A.3 HSS-ID.A.1 HSS-IC.A.1 HSS-IC.B.6	MP.2 MP.4 HSF-IF.C.7 HSF-BF.A.1	MP.2 MP.4 HSS-ID.A.1 HSS-IC.A.1 HSS-IC.B.6

Computer Science and Design Thinking	8.1.12.CS.1-3 8.1.12.NI.3,4 8.1.12.IC.1 8.1.12.DA.1-4 8.2.12.ED.1 8.2.12.ITH.1,2 8.2.12.ETW.1-3 8.2.12.EC.1-3 8.2.12.ETW.4	8.1.12.CS.1-3 8.1.12.NI.3,4 8.1.12.IC.1 8.1.12.DA.1-4 8.2.12.ED.1 8.2.12.ITH.1,2 8.2.12.ETW.1-3 8.2.12.EC.1-3 8.2.12.ETW.4	8.1.12.CS.1-3 8.1.12.NI.3,4 8.1.12.IC.1 8.1.12.DA.1-4 8.2.12.ED.1 8.2.12.ITH.1,2 8.2.12.ETW.1-3 8.2.12.EC.1-3 8.2.12.ETW.4	8.1.12.CS.1-3 8.1.12.NI.3,4 8.1.12.IC.1 8.1.12.DA.1-4 8.2.12.ED.1 8.2.12.ITH.1,2 8.2.12.ETW.1-3 8.2.12.EC.1-3 8.2.12.ETW.4	8.1.12.CS.1-3 8.1.12.NI.3,4 8.1.12.IC.1 8.1.12.DA.1-4 8.2.12.ED.1 8.2.12.ITH.1,2 8.2.12.ETW.1-3 8.2.12.EC.1-3 8.2.12.ETW.4
Career Readiness, Life Literacies, and Key Skills	9.1.12.FP.1-3 9.4.12.CI.1,2 9.4.12.CT.1 9.4.12.DC.1-4 9.4.12.GCA.1 9.4.12.IML.1-4 9.4.12.TL.1,2	9.1.12.FP.1-3 9.4.12.CI.1,2 9.4.12.CT.1 9.4.12.DC.1-4 9.4.12.GCA.1 9.4.12.IML.1-4 9.4.12.TL.1,2	9.1.12.FP.1-3 9.4.12.CI.1,2 9.4.12.CT.1 9.4.12.DC.1-4 9.4.12.GCA.1 9.4.12.IML.1-4 9.4.12.TL.1,2	9.1.12.FP.1-3 9.4.12.CI.1,2 9.4.12.CT.1 9.4.12.DC.1-4 9.4.12.GCA.1 9.4.12.IML.1-4 9.4.12.TL.1,2	9.1.12.FP.1-3 9.4.12.CI.1,2 9.4.12.CT.1 9.4.12.DC.1-4 9.4.12.GCA.1 9.4.12.IML.1-4 9.4.12.TL.1,2
Clarification Statements:	Emphasis is on the general structural properties that define molecules. Examples include r-groups of amino acids, protein shapes, the nucleotide monomers of DNA and RNA, hydrophilic and hydrophobic regions Emphasis is on the structure of cell membranes, which results in selective permeability; the	Emphasis is on illustrating inputs and outputs of matter and the transfer and transformation of energy in photosynthesis by plants and other photosynthesizing organisms. Examples of models could include diagrams, chemical equations, and conceptual models. Emphasis is on using evidence from models and simulations to support explanations. Crosscutting Concept:	Emphasis is on: (1) distinguishing between group and individual behavior, (2) identifying evidence supporting the outcomes of group behavior, and (3) developing logical and reasonable arguments based on evidence. Examples of group behaviors could include flocking, schooling, herding, and cooperative behaviors such as hunting, migrating, and swarming Crosscutting Concept:	Emphasis is on the replication and separation of DNA and cellular material, changes in chromosome number, number of cell divisions, and number of cells produced in a complete cycle. Emphasis is on the cause and effect relationships between DNA, the proteins it codes for, and the resulting traits observed in an organism.	Emphasis is on a conceptual understanding of the role each line of evidence has relating to common ancestry and biological evolution. Examples of evidence could include similarities in DNA sequences, anatomical structures, and order of appearance of structures in embryological development. Emphasis is on analyzing shifts in numerical distribution of traits and

	movement of molecules across them via osmosis, diffusion and active transport maintains dynamic homeostasis. Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. One example a student might develop is an artery that depends on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system. Examples of investigations could include heart rate response to exercise, stomata response to moisture and temperature, and root development in	Emphasis is on the conceptual understanding of the inputs and outputs of the process of cellular respiration. Science and Engineering Concepts: Examples of models could include simulations and mathematical models. Crosscutting Concept: Emphasis is on conceptual understanding of the role of aerobic and anaerobic respiration in different environments. Science and Engineering Concepts: Emphasis is on using a mathematical model of stored energy in biomass to describe the transfer of energy from one trophic level to another and that matter and energy are conserved as matter cycles and energy flows through ecosystems. Emphasis is on atoms and molecules such as carbon, oxygen, hydrogen and nitrogen being conserved as they move through an ecosystem.	Emphasis is on quantitative analysis and comparison of the relationships among interdependent factors including boundaries, resources, climate, and competition. Examples of mathematical comparisons could include graphs, charts, histograms, and population changes gathered from simulations or historical data sets. Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and extreme changes, such as volcanic eruption or sea level rise. Science and Engineering Concepts: Examples of mathematical representations include finding the average, determining trends, and using graphical comparisons of multiple sets of data. Examples of human activities can include urbanization, building dams, and dissemination of	Focus is on how a change in genotype, when expressed as a phenotype, provides a variation that can be subject to natural selection. Science and Engineering Concepts: Emphasis is on using data to support arguments for the way variation occurs. Emphasis is on the use of mathematics to describe the probability of traits as it relates to genetic and environmental factors in the expression of traits.	using these shifts as evidence to support explanations. Science and Engineering Concepts: Emphasis is on using data to provide evidence for how specific biotic and abiotic differences in ecosystems (such as ranges of seasonal temperature, long-term climate change, acidity, light, geographic barriers, or evolution of other organisms) contribute to a change in gene frequency over time, leading to adaptation of populations. Emphasis is on: (1) distinguishing between group and individual behavior, (2) identifying evidence supporting the outcomes of group behavior, and (3) developing logical and reasonable arguments based on evidence. Examples of group behaviors could include flocking, schooling, herding, and cooperative behaviors such as hunting, migrating, and swarming

	response to water levels.		invasive species. Students design solutions and simulations for a proposed problem related to threatened or endangered species, or to genetic variation of organisms for multiple species.		and how these behaviors influence reproduction. Emphasis is on determining cause and effect relationships for how changes to the environment such as deforestation, fishing, application of fertilizers, drought, flood, and the rate of change of the environment affect distribution or disappearance of traits in species. Emphasis is on using evidence to explain the influence each of the four factors has on number of organisms, behaviors, morphology, or physiology in terms of ability to compete for limited resources and subsequent survival of individuals and adaptation of species. Examples of evidence could include mathematical models such as simple distribution graphs and proportional reasoning.
Assessment Boundary:	Assessment does not include identification or the molecular	Assessment does not include specific biochemical steps. Assessment does not include the details of the specific	Assessment does not include deriving mathematical equations to make comparisons.	Assessment does not include specific gene control mechanisms or rote memorization of the steps of mitosis.	Assessment is limited to basic statistical and graphical analysis. Assessment does not

	sequence and structure of specific molecules Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis. Assessment does not include interactions and functions at the molecular or chemical reaction level, or identification of specific cells, tissues and organs. Assessment does not include the cellular processes involved in the feedback mechanism.	chemical reactions or identification of macromolecules. Assessment should not include identification of the steps or specific processes involved in cellular respiration. Assessment does not include the specific chemical steps of photosynthesis and respiration. Assessment does not include the specific chemical processes of either aerobic or anaerobic respiration. Assessment is limited to proportional reasoning to describe the cycling of matter and flow of energy.	Assessment is limited to provided data.	Assessment does not include memorization of the steps of meiosis or mitosis. Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process. Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis. Assessment does not include enzymes and factors involved or rote memorization of the steps of transcription and translation. Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process. Assessment does not include Hardy-Weinberg calculations.	include allele frequency calculations. Assessment does not include other mechanisms of evolution, such as genetic drift, gene flow through migration, and co-evolution.

Teacher Notes:	Human body systems (circulatory, excretory, digestive, respiratory, muscular, and nervous systems) are addressed in middle school.				
Activities	1. Nova - scientific method with paper helicopters 2. Where on Earth is the Water? Flinn 3. Series of water properties demonstrations 4. Jelly - Belly Protein synthesis 5. Protein synthesis activity from WP workshop 6. Modeling Structure of DNA activity BZ-39 7. DNA origami 8. DNA nitrogen base sequencing game; Nobelprize.org 9. Human Venn Diagram using hula hoops 10. Osmotic egg 11. Osmotic grapes 12. Pineapple Enzymes and Jell-O protein 13. Mitosis microview	1 ATP puppet show 2. Educational Interactive posters 3. Experts of a Stage of photosynthesis or Cellular Respiration	1. Biome data analysis set Example of Interdisciplinary with Math 2. outdoor Abiotic and Biotic scavenger hunt 3. Raritan River - Historical land use linked to birth defects marking period project Example of Interdisciplinary with Social Studies 4. Food chains and Food web activity packet 5. Energy pyramid practice problems 6. Symbiotic Google images summary 7. predator - prey graphing exercise 8. Carrying Capacity case study analysis 9. Predator - Prey simulation game 10. Species Dynamics board games	1. Student video clip and review set lesson of a concept 2. Chain Notes 3. Frayer Model notes 4. Modeling Meiosis 5. Sequencing note cards activity 6. Punnett Square practice sets 7. Pedigree practice sets 8. BZ-162 & BZ-163 9. Poster Baby Project 10. Who is the parents? Dihybrid cross activity using blood types	1. Student team lessons 2. Student team time lines using technology “Padlet” 3. Class Debate 4. BZ- 184 and BZ-187-188 mathematics data analysis

			11. Mt. Saint Helen Activity for Succession 12. Carbon Cycle impacts graphing practice and analysis 13. Human impact on biodiversity data analysis		
Interdisciplinary Examples (common core language)	With DNA technology, such as the Human Genome Project, make a claim (CER) to support your opinion if it is ethical to control mutations in species like humans. Cite evidence from various DNA technologies that can be used. The Hierarchy of Organ Systems activity	Eco News Segment Project	C.E.R. Great Whites vs Seals	**Constructed Response:** With DNA technology, such as the Human Genome Project, make a claim (CER) to support your opinion if it is ethical to control mutations in species like humans. Cite evidence from various DNA technologies that can be used.	Explaining Evolutionary Processes Activity
mathematics standards examples		Martian Photosynthesis	Energy Pyramid Calculation Activities	Poster Baby Project Probability Calculations Dihybrid Cross of Blood Types Calculations	Beak Depth statistics analysis
Evaluation/ Formative Assessments	1. Anonymous Hand-in, Pass out 2. A-B-C Summary 3. Gallery Walk	1. Gallery Walk 2. video reviews 3. Jeopardy online free site 4. Tests and quizzes	1. Hand-in, Pass out 2. Headbandz 3. Video reviews 4. Stick Note Concept Mapping	1. Sticky note Bar Graph Analysis 2. video clips and review sets	1. video clips and review sets 2. Gallery Walk 3. Tests and Quizzes 4. Taboo

	4. A & D statements 5. Taboo 6. Formal lab report 7. Tests and quizzes 8. video reviews 9. Constructed Response -Benchmark Assessment: Poster Baby Project. In partners students will research their genotypes for several traits, cross their genotypes with their partner to identify possible traits passed onto their poster baby as well as the traits passed onto their grandbaby. Explain how traits are able to "skip a generation"?	5. Constructed Response --In this investigation, you will choose an organ system and find a way to model its structure and function, especially in terms of its levels of organization, from cell types to tissues to organs and to organ systems. 1. Identify how your model portrayed the relationships between cell types, tissues, organs, and organ systems. 2. Which aspects of your model were the most like the system being modeled? Which aspects were unlike the system being modeled? Explain. Discovery Education Science © Discovery Communications, LLC 3. Explain how your model portrayed interactions at multiple levels among systems.	5. Gallery Walk 6. Tests and Quizzes 7. Constructed Response --Benchmark Assessment: Students will complete a CER on the population control of New Jersey white - tailed deer. Focus Question: Which method would be most ideal; 1. Hunting Seasons to replace natural predators 2. Reintroduce and/or increase natural predator populations or 3. Relocation of some deer to a different location 4. Rutgers deer management method of Contraception?	3. Anonymous hand-in, Pass out 4. Headbandz 5. Gallery Walk 6. Tests and Quizzes 7. Constructed Response --Students will develop a model that addresses the following: Display the events occuring at each stage (Academy) Displays the different functions of mitosis. Display compare and contrast of normal mitosis versus abnormal mitosis.	
Resources	Possible Website: http://www.biologycorner.com/ Amoeba Sisters Osmosis a love story Nobelprize.org				
Common Accommoda-tions	Extra time, chunking, modeling, frequent breaks, assigned seats, guided notes, use of models, digital text, text can read to students, graphic organizers, checklist, daily do-now, exit ticket, monthly outlook, study guides, require notebook/chromebook for class, oral responses acceptable as needed, word bank as needed, read tests aloud as needed, options to refine ideas, assigned/preferential seating additional time as needed, daily SEL activities				