

Descriptor of the intent of the Biology course: "Biology of organisms and cells concerns living things, their appearance, different types of life, the scope of their similarities and differences, where they live and how they live. Living things are made of the same components as all other matter, involve the same kinds of transformation of energy and move using the same basic kinds of forces as described in chemistry and physics. Through the study of the diversity of life, students learn how life has evolved. This great variety of life forms continues to change even today as genetic instructions within cells are passed from generation to generation, yet the amazing integrity of most species remain." source Pennsylvania Department of Education; [Academic Standards for Science and Technology and Engineering Education](#); pg 7 January 29, 2010

Month	Duration	PA Keystone Assessment Anchors	Eligible Content	*Quarterly Assessments	Content and Instructional Activities	Resources
August	3 days	BIO.A.1.1.1: Describe the characteristics of life shared by all prokaryotic and eukaryotic organisms.	BIO.A.1.2.1 Compare cellular structures and their functions in prokaryotic and eukaryotic cells.	Formal lab discussions, Lab reports, graphs	Describe the major characteristics that distinguish living from non-living things. Characteristics of life lab	Living protozoa, elodea, bacteria, oil immersion demonstration scope
September	5 days Intro to Biology (8 days)	Tools of Science and Science as Inquiry	3.1.10 A-C	Journal reflection addressing EC/Standard; Concept mapping to review for EC journal reflections, tests;	Examine the status of existing theories, evaluate experimental information, judge that conclusions are consistent and logical with experimental conditions, interpret results of experimental research to predict new information, communicate and defend a scientific argument. Apply the Scientific method to Case studies; evaluating claims; creating and interpreting graphical data; Identifying the difference between Observation/Hypothesis/Conclusion/Theory/Law	
September	5 days	BIO.A.2.1.1: Describe the unique properties of water and how these properties support life on Earth.	BIO.A.2.1 Describe the unique properties of water and how these properties support life on Earth (e.g., freezing point, high specific heat, cohesion).	Quizzes (approximately one per every two sections in the text); Test (one per chapter, or every major concept)	What is a polar molecule and how does polarity affect bonding between water (hydrogen bonds)? Creating a wet mount of living plant and animal cells. Water demonstrations for cohesion and adhesion. Draw hydrogen bonds between water molecules and use water properties to explain biological phenomena. Demonstrate dissolving, freezing, thawing, evaporation.	Water molecule kits, capillary tubes, white carnations and food coloring, overhead projection
September	14 days	BIO.A.2.2 Describe and interpret relationships between structure and function at various levels of biochemical organization (i.e., atoms, molecules, and macromolecules)	BIO.A.2.2.1: Explain how carbon is uniquely suited to form biological macromolecules.	Quarterly Exam to review	What are the building blocks of carbohydrates, proteins, lipids and nucleic acids? Structure lab	model kits
			BIO.A.2.2.2: Describe how biological macromolecules form from monomers.		What is each used for in living things?	
			BIO.A.2.2.3: Compare and contrast the structure and function of carbohydrates, lipids, proteins, and nucleic acids in organisms.		What methods and indicators are used to identify nutrients in foods? Burger Mash up/presence testing lab	biuret, brown paper bag, iodine
October	7 days	BIO.A.2.3 Explain how enzymes regulate biochemical reactions within a cell.	BIO.A.2.3.1: Describe the role of an enzyme as a catalyst in regulating a specific biochemical reaction. BIO.A.2.3.2: Explain how factors such as pH, temperature, and concentration levels can affect enzyme function.		How does concentration level affect enzyme reactions? toothpickase lab	10,000 toothpicks, graph paper, timers
Chemistry of Life	(26 days)				How do pH and temperature affect proteins (enzymes)? ceviche', cooking an egg	culinary arts

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October	16 days	BIO.A.1.2 Describe relationships between structure and function at biological levels of organization.	BIO.A.1.2.2 Describe and interpret relationships between structure and function at various levels of biological organization (i.e., organelles, cells, tissues, organs, organ systems, and multicellular organisms).	Formal lab discussions, Lab reports, graphs	Identify organelles & functions in eukaryotic cell	organelle lab; microscope labs - cork, onion, elodea, various single cell organisms
			BIO.B.2.2.2: Describe the role of ribosomes, endoplasmic reticulum, Golgi apparatus, and the nucleus in the production of specific types of proteins.	Journal reflection addressing EC/Standard; Concept mapping to review for EC journal reflections, tests.	Explain how the structure of an organelle is essential to its function.	
November	6 days	BIO.A.4.1 Identify and describe the cell structures involved in transport of materials into, out of, and throughout a cell.	BIO.A.4.1.1 Describe how the structure of the plasma membrane allows it to function as a regulatory structure and/or protective barrier for a cell.	Quizzes (approximately one per every two sections in the text); Test (one per chapter, or every major concept)	What are main organelles of eukaryotes and how do they function as individually and as a whole	Microscope slides and coverslips. Sterilized animal blood, living elodea
			BIO.A.4.1.2 Compare the mechanisms that transport materials across the plasma membrane (i.e. passive transport -- diffusion, osmosis, facilitated diffusion; and active transport -- pumps, endocytosis, exocytosis).	Quarterly Exam to review	plasmolysis, turgor pressure	
			BIO.A.4.1.3 Describe how membrane-bound cellular organelles (e.g. endoplasmic reticulum, Golgi apparatus) facilitate the transport of materials within a cell.		What are the main reactants and products of photosynthesis and cellular respiration?	Stomata Lab, chromatography lab,
December	14 days	BIO.A.3.1 Identify and describe the cell structures involved in processing energy.	BIO.A.3.1.1: Describe the fundamental roles of plastids (e.g., chloroplasts) and mitochondria in energy transformations.		How does the cell membrane keep some substances out? Which substances can cross the lipid bilayer?	
		BIO.A.3.2 Identify and describe how organisms obtain and transform energy for their life processes.	BIO.A.3.2.1: Compare the basic transformation of energy during photosynthesis and cellular respiration.		How do prokaryotes and eukaryotes differ in structure and function?	
			BIO.A.3.2.2: Describe the role of ATP in biochemical reactions.		What is the endosymbiont theory?	Endosymbiosis
Cell structure and function (36 days)						
December	6 days	BIO.A.4.2 Explain mechanisms that permit organisms to maintain biological balance between their internal and external environments.	BIO.A.4.2.1: Explain how organisms maintain homeostasis (e.g., thermoregulation, water regulation, oxygen regulation).			Measure the rate of cell respiration in various organisms under various conditions using digital equipment.
Maintaining Homeostasis (6 days)						
January	12 days	BIO.B.1.1 Describe the three stages of the cell cycle: interphase, nuclear division, cytokinesis	BIO.B.1.1.1 Describe the events that occur during the cell cycle: interphase, nuclear division (i.e. mitosis or meiosis), cytokinesis			
			BIO.B.1.1.2 Compare the processes and outcomes of mitotic and meiotic nuclear divisions.			
Cell replication (12 days)						

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February	15 Days	BIO.B.2 Genetics BIO.B.2.1 Compare Mendelian and non-Mendelian patterns of inheritance. BIO.B.2.2 Explain the process of protein synthesis (i.e., transcription, translation, and protein modification).	BIO.B.2.2.1: Describe how the processes of transcription and translation are similar in all organisms. BIO.B.2.2.2: Describe the role of ribosomes, endoplasmic reticulum, Golgi apparatus, and the nucleus in the production of specific types of proteins. BIO.B.2.1.1: Describe and/or predict observed patterns of inheritance (i.e., dominant, recessive, co-dominance, incomplete dominance, sex-linked, polygenic, and multiple alleles). BIO.B.2.1.2: Describe processes that can alter composition or number of chromosomes (i.e., crossing-over, nondisjunction, duplication, translocation, deletion, insertion, and inversion).	Formal lab discussions, Lab reports, graphs	How do replication, transcription and translation differ?	Transcription/translation Lab	
				Quizzes (approximately one per every two sections in the text)	Discuss the advantages and disadvantages of stem-cell research.	Genetic Crosses Probability Lab	Pennies/Dice
				Formal lab discussions, Lab reports, graphs	Compare and contrast DNA mutations and chromosomal mutations.	Mendel's Legacy- Pea Plant Genetics Trait Lab Pedigree Lab	PTC Strips
				Weekly Quiz			
				Concept mapping	Chemical signals, encoded in genetic code, are responsible for differentiation.	Modeling Lab	Clay Kit
				Journal reflection	How do cells differentiate? How do mutations occur and what is the consequence of various mutations?	"Snork" Creation Mutations by analogy	
				Journal reflection	How do small genetic changes accumulate in a gene pool?	Chromosomes & Inheritance Human Genetics	
				Weekly Quiz			
				Unit Test 8			
				March	13 Days	BIO.B.1 Cell Growth and Reproduction BIO.B.1.2 Explain how genetic information is inherited.	BIO.B.1.2.1: Describe how the process of DNA replication results in the transmission and/or conservation of genetic information. BIO.B.1.2.2: Explain the functional relationships among DNA, genes, alleles, and chromosomes and their roles in inheritance.
April	16 Days	BIO.B.3 Theory of Evolution BIO.B.3.1 Explain the mechanisms of evolution.	BIO.B.3.1.1: Explain how natural selection can impact allele frequencies of a population. BIO.B.3.1.2: Describe the factors that can contribute to the development of new species (e.g., isolating mechanisms, genetic drift, founder effect, migration). BIO.B.3.1.3: Explain how genetic mutations may result in genotypic and phenotypic variations within a population.	Formal lab discussions, Lab reports, graphs	Biogenesis/The First Life Forms Be able to support the theory of evolution using specific documentations, examples and experiments.	Grouping Lab Earth's History	
				Journal reflection	Theories of Evolution Compare various mechanisms of evolution.	Fossil Record Geological Time Scale	Fossil examples
				Weekly Quiz			
				Formal lab discussions, Lab reports, graphs	History of Taxonomy Modern Phylogenetic Taxonomy Two Modern Systems of Classification How does genetics play a role in speciation?	Evolution in Process Height Variation Horse Variation Lab Linneaus Lab	
				Unit Test 10			

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May	20 Days	BIO.B.4 Ecology		Weekly Quiz		
		BIO.B.4.1 Describe ecological levels of organization in the biosphere.	BIO.B.4.1.1: Describe the levels of ecological organization (i.e., organism, population, community, ecosystem, biome, biosphere).	Formal lab discussions, Lab reports, graphs	What is the difference between a population and a community?	Bean Counting Lab Tag/Recapture Lab
			BIO.B.4.1.2: Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems.		Discuss and research solutions to using natural resources. Explain advantages and disadvantages.	Fuel Sources -What's the Cycle? Who is hurting? Lab
				Weekly Quiz		
		BIO.B.4.2 Describe interactions and relationships in an ecosystem	BIO.B.4.2.1: Describe how energy flows through an ecosystem (e.g., food chains, food webs, energy pyramids).		What is the human impact on various ecosystems?	Food webs (outdoor lab)
			BIO.B.4.2.2: Describe biotic interactions in an ecosystem (e.g., competition, predation, symbiosis).		Explain how habitat destruction, overpopulation, pollution, invasive species	Methods of control debate
			BIO.B.4.2.3: Describe how matter recycles through an ecosystem (i.e., water cycle, carbon cycle, oxygen cycle, nitrogen cycle).		water cycle, carbon cycle, oxygen cycle, nitrogen cycle	Introduce fires (controlled burns)
			BIO.B.4.2.4: Describe how ecosystems change in response to natural and human disturbances (e.g., climate changes, introduction of nonnative species, pollution, fires).	Journal reflection	What is the difference between primary and secondary succession?	Yellowstone Park Analysis
				Journal reflection	Overharvesting influences biodiversity around the world.	Analysis of the Seas
		Minimum 10 assessments recorded in gradebook per mking. Pd		Weekly Quiz		
			BIO.B.4.2.5: Describe the effects of limiting factors on population dynamics and potential species extinction.	Journal reflection	What are limiting factors? What is a keystone species and how are they identified by ecological criteria?	Case Study Otter Population
				Unit Test 11		