

End of Course Biology

[Prerequisite Quiz](#)

[Prerequisite Content and Skills](#)

I. Science Practices	CPI	Text Page	Pacing
<ol style="list-style-type: none">1. Learning facts, concepts, principles, theories and models; then...2. Developing an understanding of the relationships among facts, concepts, principles, theories and models; then...3. Using these relationships to understand and interpret phenomena in the natural world	5.1.12.A.1		View Discussion Board
<ol style="list-style-type: none">1. Using tools, evidence and data to observe, measure, and explain phenomena in the natural world.2. Developing evidence-based models based on the relationships among fundamental concepts and principals3. Constructing and refining explanations, arguments or models of the natural world through the use of quantitative and qualitative evidence and data	5.1.12.A.2		View Discussion Board
<ol style="list-style-type: none">1. Understanding that data differs in quality and strength of explanatory power based on experimental design2. Evaluating strength of scientific arguments based on the quality of the data and evidence presented3. Critiquing scientific arguments by considering the selected experimental design and method of data analysis	5.1.12.A.3		View Discussion Board
<ol style="list-style-type: none">1. Asking a question and deciding what to measure in order to answer it.2. Developing strategies for obtaining measurements, then systematically collecting data3. Structuring the gathered data, then interpreting and evaluating the data4. Using the empirical results to determine the causal/correlational relationships	5.1.12.B.1		View Discussion Board
<ol style="list-style-type: none">1. Using mathematics in the collection and treatment of data and in the reasoning used to develop concepts, laws and theories2. Using tools of data analysis to organize data and formulate hypothesis for further testing3. Using existing mathematical, physical, and computational models to analyze and communicate findings.	5.1.12.B.2		View Discussion Board
<ol style="list-style-type: none">1. Making claims based on the available evidence2. Explaining the reasoning, citing evidence, behind a proposed claim3. Connecting the claim to established concepts and principles	5.1.B.12.3		View Discussion Board
<ol style="list-style-type: none">1. Analyzing experimental data sets using measures of central tendency2. Representing and describing mathematical relationships among variables using graphs and tables	5.1.B.12.4		View Discussion Board

3. Using mathematical tools to construct and evaluate claims			Board
1. Reflecting on the status of one's own thinking and learning. (i.e. uncovering how a student knows what they know and why) 2. Understanding that scientific knowledge can be revised as new evidence emerges.	5.1.12.C.1		View Discussion Board
1. Recognizing that predictions or explanations can be revised on the basis of seeing new data and evidence 2. Using data and evidence to modify and extend investigations 3. Understanding that explanations are increasingly valuable as they account for the available evidence more completely	5.1.12.C.2		View Discussion Board
1. Understanding that there might be multiple interpretations of the same phenomena 2. Stepping back from evidence and explanations to consider whether another interpretation of a particular finding is plausible with respect to existing scientific evidence 3. Considering alternative perspectives worthy of further investigations	5.1.12.C.3		View Discussion Board
1. Seeing oneself as an effective participant and contributor in science 2. Interacting with others to test new ideas, soliciting and providing feedback, articulating and evaluating emerging explanations, developing shared representations and models, and reaching consensus 3. Developing a sense of appropriate trust and skepticism when evaluating other's claims, evidence and reasoning	5.1.12.D.1		View Discussion Board
1. Constructing literal representations from empirical evidence and observation 2. Presenting and defending a scientific argument using literal representations 3. Evaluating others literal representations for consistency with their claims, evidence and reasoning 4. Moving fluently between representations such as graphs, data, equations, diagrams and verbal explanations.	5.1.12.D.2		View Discussion Board
1. Selecting and using appropriate instrumentation to design and conduct investigations 2. Understanding, evaluating and practicing safe procedures for conducting science investigations 3. Demonstrating appropriate digital citizenship (i.e. cyber-safety and cyber-ethics) when accessing scientific data from collaborative spaces. (See NJCCCS 8.1 and 9.1) 4. Ensuring that living organisms are properly cared for and treated humanely, responsibly, and ethically.	5.1.12.D.3		View Discussion Board

II. Biochemistry/ Chemistry <u>Suggested Core Vocabulary</u> <u>Suggested Benchmark Questions</u>	CPI	Text Page	Pacing (20 class periods)
1. Analyzing and explaining how cells carry out a variety of chemical transformations that allow conversion of energy from one form to another, the breakdown of molecules into smaller units, and the building of larger molecules from smaller ones Assessments will not include the molecular basis of enzyme function.	5.3.12.A.2		View Discussion Board
2. Recognizing that most chemical transformations are made possible by protein catalysts called enzymes.	5.3.12.A.2		View Discussion Board
3. Identifying enzymes as proteins, and determining how they catalyze biochemical reactions Assessments will not include the molecular basis of enzyme catalysts	5.3.12.A.2		View Discussion Board
4. Conduction experiments to demonstrate that the activities of enzymes are affected by temperature, ionic conditions, and the pH of the surroundings	5.3.12.A.2		View Discussion Board
5. Explaining how molecules are used to assemble larger molecules with biological activity (including proteins, DNA, sugars and fats) Assessments will not include the representations of specific detailed steps of synthesis and decomposition (intermediate steps and molecules, details of dehydration synthesis)	5.2.12.B.1		View Discussion Board
6. Recognizing that all matter tend toward more disorganized states, and that living systems require a continuous input of energy to maintain their chemical and physical organizations.	5.3.12.B.2		View Discussion Board
7. Recognizing that the chemical bonds of food molecules contain energy, which is released when the bonds of food molecules are broken and new compounds with lower energy bonds are formed. Assessments will not include the representations of specific detailed steps of synthesis and decomposition (intermediate steps and molecules, details of dehydration synthesis)	5.3.12.B.2		View Discussion Board
8. Recognizing that all living systems require a continuous input of energy to maintain their chemical and physical organizations and also understanding that with death (the cessation of energy input), living systems rapidly disintegrate.	5.3.12.B.3		View Discussion Board
9. Recognizing that food molecules are taken into cells and react to provide the chemical constituents needed to synthesize other food molecules, and knowing that the breakdown and synthesis are made possible by enzymes.	5.3.12.B.6		View Discussion Board
10. Identifying how the total amount in a system remains constant, even though its form and location change.	5.3.12.B.1		View Discussion Board

III. Cell Biology and Cellular Transport

Suggested Core Vocabulary | Suggested Benchmark Questions

CPI

Text Page

Pacing
(15 class periods)

1. Modeling how processes are regulated both internally and externally by environments in which cells exist.	5.3.12.A.3		View Discussion Board
2. Explaining how the fundamental life processes of organisms depend on a variety of chemical reactions that occur in specialized areas of the organisms cells. a. <i>Assessments will not include the identification of cellular organelles.</i>	5.3.12.D.2		View Discussion Board
3. Modeling how cells are enclosed within semi-permeable membranes that regulate their interaction with their surroundings, including the transport of materials in and out of the cell. a. <i>Assessments will not include the molecular basis of membrane transport</i>	5.3.12.D.2		View Discussion Board
4. Explaining that only mutations in germ cells can create the variation that changes an organism's offspring a. <u>SPECIFIC DETAILED STEPS OF MEIOSIS WILL NOT BE TESTED!</u>	5.3.12.D.2		View Discussion Board
5. Present evidence that supports the concept that complex multi-cellular organisms are formed as highly organized arrangement of differentiated cells.	5.3.12.A.4		View Discussion Board
6. Describe the relationships within multi-cellular organisms, where cells perform specialized functions as parts of sub-systems (e.g., tissues, organs, and organ systems), which work together to maintain optimum conditions for the benefit of the whole organism. a. <i>Assessments will not include the identification of specific tissues, organs, or body systems.</i>	5.3.12.A.6		View Discussion Board

IV. Photosynthesis <u>Suggested Core Vocabulary</u> <u>Suggested Benchmark Questions</u>	CPI	Text Page	Pacing (10 class periods)
1. Recognizing the process of photosynthesis as providing a vital connection between the sun and the energy needs of living systems.	5.3.12.B.4		View Discussion Board
2. Describing how plants capture energy by absorbing light and use it to form strong chemical bonds between the atoms of carbon-containing molecules. <i>a. Assessments will not include the representations of specific detailed steps of photosynthesis (intermediate steps and products of the light-dependent and light-independent reactions)</i>	5.3.12.B.4		View Discussion Board
3. Tracing the path of energy entering ecosystems as sunlight follows when being transferred by producers into chemical energy through photosynthesis, and then being passed from organism to organism through food webs. <i>a. Assessments will not include the representations of specific detailed steps of photosynthesis and respiration (intermediate steps and products of the Calving Cycle, Krebs/citric acid cycle and glycolysis)</i>	5.3.12.B.3		View Discussion Board
4. Designing independent investigations to determine the effects of changing environmental factors on photosynthesis.	5.3.12.B.4		View Discussion Board
5. Analyzing and describing how the process of photosynthesis provides a vital connection between the sun and the energy needs of living systems.	5.3.12.B.5		View Discussion Board
6. Explaining how plants and many microorganisms use solar energy to combine molecules of carbon dioxide and water into complex, energy rich organic compounds and release oxygen to the environment. <i>a. Detailed steps of photosynthesis and respiration (intermediate steps and products of Calving, Kreb's/citric acid cycle, and glycolysis) will not be tested.</i>	5.3.12.B.5		View Discussion Board

V. Cellular Respiration Suggested Core Vocabulary Suggested Benchmark Questions	CPI	Text Page	Pacing (10 class periods)
1. Examining how the breakdown of some food molecules enables the cell to store energy in specific molecules that are used to carry out the many functions of the cell.	5.3.12.B.6		View Discussion Board
2. Tracing the process in which nutrients are transported to cells to serve as building blocks for the synthesis of structures and as reactants for cellular respiration. <ol style="list-style-type: none"> a. <i>Assessments will not include the representation of specific detailed steps of respiration (intermediate steps of products of the Krebs's/citric acid cycle and glycolysis)</i> 	5.3.12.B.6		View Discussion Board

VI. Cellular Reproduction Suggested Core Vocabulary Suggested Benchmark Questions	CPI	Text Page	Pacing (15 class periods)
1. Tracing the general process where progeny from a single cell form an embryo in which cells multiply and differentiate to form the many specialized cells, tissues and organs that comprise the final organism. <ol style="list-style-type: none"> a. <i>Assessments will not include the details or graphic demonstration of each stage in mitosis.</i> 	5.3.12.A.4		View Discussion Board
2. Explaining the process where an egg and sperm unite to begin the development of a new individual, and how that new individual receives genetic information from its parents.	5.3.12.D.3		View Discussion Board
3. Explaining how sexually produced offspring are never identical to either of their parents.	5.3.12.D.3		View Discussion Board
4. Explaining that only mutations in germ cells can create the variation that changes an organism's offspring.	5.3.12.D.2		View Discussion Board
5. Understanding how heritable characteristics can result from new combinations of existing genes in reproductive cells.	5.3.12.D.3		View Discussion Board

VII. DNA/ Genes/ Genetics <u>Suggested Core Vocabulary</u> <u>Suggested Benchmark Questions</u>	CPI	Text Page	Pacing (25 class periods)
1. Identifying genes as a set of instructions encoded in DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism.	5.3.12.A.5		View Discussion Board
2. Relating the specialization of cells in multi-cellular organisms to the different patterns of gene expression rather than to difference of the genes themselves.	5.3.12.A.5		View Discussion Board
3. Explaining how many cells in an individual can be very different from one another, even though they are all descended from a single cell and thus have essentially identical genetic information.	5.3.12.A.4		View Discussion Board
4. Provide examples of how different parts of the genetic instructions are influenced by the cell's environment.	5.3.12.A.4		View Discussion Board
5. Be able to analyze, support, and/or critique current emerging biotechnologies. a. Ex. STEM CELL DEBATE c. Transgenics b. Cloning d. <u>NOTE: PCR and Gel Elect. Mechanisms NOT ON TEST</u>	5.3.12.A.5		View Discussion Board
6. Identifying, explaining and demonstrating how technology can be used to determine evolutionary relationships among species. a. Gel Electrophoresis b. DNA/amino acid sequences	5.3.12.E.2		View Discussion Board
7. Identifying emerging biotechnology that show promise in preventing and treating disease a. Gene therapy	5.3.12.A.6		View Discussion Board
8. Recognize that certain chemicals, pathogens, and high-energy radiation can seriously impair normal cell functions and the health of entire organism.	5.3.12.A.6		View Discussion Board
9. Recognizing that the instructions for specifying the characteristics of the organism are carried in DNA, a large polymer formed from subunits of four kinds (adenine, thymine, and cytosine)	5.3.12.D.1		View Discussion Board
10. Explaining how the chemical and structural properties of DNA allow for the genetic information to be both encoded in genes and replicated	5.3.12.D.1		View Discussion Board
11. Identifying that heredity information is contained in genes, located in the chromosomes of each cell, and each gene carries a single unit of information. (1 gene 1 polypeptide)	5.3.12.D.1		View Discussion Board
12. Providing specific examples of how an inherited trait of an individual can be determined by one or many genes and a single gene can influence more than one trait.	5.3.12.D.1		View Discussion Board
13. Analyzing the current and potential impact of genome projects on human health (e.g. pathogenic bacteria or disease vectors) or species with commercial importance (e.g. livestock or crop plants)	5.3.12.D.1		View Discussion Board
	5.3.12.D.2		

14. Recognize that changes in DNA (mutations) occur spontaneously at low rates, and some of these changes make no difference to the organism, whereas others can change cells and organisms			View Discussion Board
15. Tracing the progression of conditions that result from genetic mutation in a <u>variety of different organisms</u> . a. Ex. Humans – Diabetes, Sickle Cell, Cystic Fibrosis etc... b.	5.3.12.D.2		View Discussion Board
16. Recognizing how heritable characteristics can strongly influence how likely an individual is to survive and reproduce. (Fitness)	5.3.12.D.3		View Discussion Board

VIII. Evolution/Taxonomy <u>Suggested Core Vocabulary</u> <u>Suggested Benchmark Questions</u>	CPI	Text Page	Pacing (15 class periods)
1. Describing how evolution involves changes in the genetic make-up of whole populations over time, not changes in the genes of an individual organism.	5.3.12.E.1		View Discussion Board
2. Integrating scientific information from a variety of disciplines to provide evidence for the relatedness of species on Earth (Geology, comparative anatomy, biochemistry, and taxonomy)	5.3.12.E.2		View Discussion Board
3. Analyzing natural selection simulations and use the data generated to describe how environmentally favored traits are perpetuated over generations resulting in species survival, while less favorable traits decrease in frequency or may lead to extinction.	5.3.12.E.1		View Discussion Board
4. Recognizing that change in a species over time does not follow a set pattern or timeline	5.3.12.E.3		View Discussion Board
5. Explaining how the millions of different species on Earth today are related by common ancestry using evidence a. Homologous/analogous structures c. Amino Acid sequencing (molecular similarities) b. Embryology d. Geological evidence – (Fossil record/Biogeography)	5.3.12.E.3		View Discussion Board
6. Using natural selection and its evolutionary consequences to provide a scientific explanation for the fossil record of ancient life forms, and the molecular similarities observed among the diverse species of living organisms. (Unity in Diversity) (Common Ancestry)	5.3.12.E.3		View Discussion Board
7. Discussing how environmental pressure, genetic drift, mutation, and competition for resources influence the evolutionary process	5.3.12.E.4		View Discussion Board
8. Predicting possible evolutionary implications for a population due to environmental changes over time (e.g., volcanic eruptions, global climate change, pollution)	5.3.12.E.4		View Discussion Board
9. Recognizing how heritable characteristics can strongly influence how likely an individual is to survive and reproduce. (Fitness)	5.3.12.D.3		View Discussion Board

IX. Ecology <u>Suggested Core Vocabulary</u> <u>Suggested Benchmark Questions</u>	CPI	Text Page	Pacing (25 class periods)
1. Analyzing interactions between organisms that results from the ability to produce populations of infinite size in an environment where resources are finite. b. Carrying capacity c. Population graph	5.3.12.C.1		View Discussion Board
2. Providing evidence of how organisms both cooperate and compete in ecosystems	5.3.12.C.1		View Discussion Board
3. Using evidence to explain why interrelationships and interdependencies of organisms may generate stable ecosystems. a. Food Webs b. Population Data regarding Pred/Prey relationships c. Research the effect of removing a particular species from a particular habitat	5.3.12.C.1		View Discussion Board
4. Identify situations where humans intentionally and unintentionally modify ecosystems as a result of population growth, technology, and consumption. a. Developments(loss of habitat), Roads, Fences, Dams, Overfishing/Hunting	5.3.12.C.1		View Discussion Board
5. Providing evidence of how human destruction of habitats threatens current local and global ecosystem stability. a. Deforestation b. Pollution c. Overharvesting	5.3.12.C.1		View Discussion Board
6. Predicting how direct harvesting, pollution, atmospheric changes, and other factors will affect population dynamics in a given ecosystem based on data and accepted mathematical models.	5.3.12.C.1		View Discussion Board
7. Predicting how natural disasters such as hurricanes, floods, volcanoes will affect population dynamics in a given ecosystem based on data and accepted mathematical models a. Naturally occurring events CAN greatly negatively affect the environment and its organisms...Just ask the Dinosaurs.			View Discussion Board
8. Tracing the cycling of atoms and molecules on Earth among the living thing and nonliving components of the biosphere.	5.3.12.C.1		View Discussion Board
9. Following the transfer of matter (molecules) from one organism to another repeatedly and between organisms and their physical environment **Students should be able to link specific causes and actions with specific consequences.	5.3.12.B.1		View Discussion Board
10. Explaining how food webs are limited and how pyramidal relationships exist.	5.3.12.B.2		View Discussion Board
11. Calculating the trends in production, use and transfer of energy from one trophic level to another using data.	5.3.12.B.3		View Discussion Board
12. Tracing the path of energy entering ecosystems as sunlight follows when being transferred by producers into chemical energy through photosynthesis, and then being passed from organism to organism through food webs. a. Assessments will not include the representations of specific detailed steps of photosynthesis and respiration (intermediate steps and products of the Calving Cycle, Krebs/citric acid cycle and glycolysis)	5.3.12.B.3		View Discussion Board