

Basic Life Science Course Outline

I. Course Description

Students will learn the cell biology, genetics, ecology, evolution, and physiology of living things

II. Course Content

Cell Biology	Q1	Q2	Q3	Q4
1. The fundamental life processes of plants and animals depend on a variety of chemical reactions that occur in specialized areas for the organism's cells. As a basis for understanding concept:		X		
1a. <i>Student know</i> cells are enclosed within semipermeable membranes that regulate their interaction with their surroundings.		X		
1b. <i>Student know</i> enzymes are proteins that catalyze biochemical reactions with out altering the reaction equilibrium and the activities of enzymes depend on the temperature, ionic conditions, and the pH of the surroundings.		X		
1c. <i>Student know</i> how prokaryotic cells, eukaryotic cells (including those from plants and animals), and viruses differ in complexity and general structure.		X		
1d. <i>Student know</i> the central dogma of molecular biology outlines the flow of information from transcription of ribonucleic acid (RNA) in the nucleus to translation of proteins of ribosome in the cytoplasm.		X		
1e. <i>Student know</i> the role of the endoplasmic reticulum and Golgi apparatus in the secretion of proteins.		X		
1f. <i>Student know</i> usable energy is captured from sunlight by chloroplasts and is stored through the synthesis of sugar from carbon dioxide.		X		
1g. <i>Student know</i> the role of the mitochondria in making stored chemical-bond energy available to cells by completing the breakdown of glucose to carbon dioxide.		X		
1h. <i>Student know</i> most macromolecules (polysaccharides, nucleic acids, proteins, lipids) in cells and organisms are synthesized from small collection of simple precursors.				
1i*. <i>Student know</i> how chemiosmotic gradients in the mitochondria and chloroplast store energy for ATP production.				
1j*. <i>Student know</i> how eukaryotic cells are given shape and				

internal organization by cytoskeleton or cell wall or both.		X		
Genetics				
2. Mutation of sexual reproduction lead to genetic variation in population. As a basis for understanding this concept:			X	
2a. <i>Student know</i> meiosis is and early step in sexual reproduction in which the pairs of chromosomes separate and segregate randomly during cell division to produce gametes containing one chromosome of each type.			X	
2b. <i>Student know</i> only certain cells in a multicellular organism undergo meiosis.			X	
2c. <i>Student know</i> how random chromosome segregation explains the probability that particular allele will be in gamete.			X	
2d. <i>Student know</i> new combinations of alleles may generated in zygote through the fusion of male and female gametes (fertilization).			X	
2e. <i>Student know</i> why approximately half of an individual's DNA sequence comes from each parent.			X	
2f. <i>Student know</i> the role of chromosomes in determining an individual's sex.			X	
2g. <i>Student know</i> how to predict possible combinations of alleles in a zygote from genetic makeup of parents.			X	
3. A multicellular organism develops from a single zygote, and its phenotype depends on its genotype, which is established at fertilization. As basis for understanding this concept:				X
3a. <i>Students know</i> how to predict the probable outcome of phenotypes in a genetic cross from the genotypes of the genotypes of the parents and mode of inheritance (autosomal or X-linked, dominate of recessive).				X
3b. <i>Student know</i> the genetic basis for Mendel's laws of segregation and independent assortment.				X
3c*. <i>Student know</i> how to predict the probable mode of inheritance from a pedigree diagram showing phenotypes.				X
3d*. <i>Student know</i> how to use data on frequency of recombination at meiosis to estimate genetic distances between loci and to interpret genetic maps of chromosomes.				
4. Genes are set of instructions encoded in the DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism. As a basis for understand this concept:				X
4a. <i>Student know</i> the general pathway by which ribosome's synthesize proteins, using tRNA's to translate genetic				

information in mRNA.				
4b. <i>Student know</i> how to apply the genetic coding rules to predict the sequence of amino acids from sequence of codons in RNA.				X
4c. <i>Student know</i> how mutations in the DNA sequence of gene may or may not affect the expression of the gene or the sequence of amino acids in an encoded protein.				X
4d. <i>Student know</i> specialization of cells in multicellular organisms is usually due to different patterns of gene expression rather than to differences of the genes themselves.				X
4e. <i>Student know</i> proteins can differ from one another in the number and sequence of amino acids.				
4f*. <i>Student know</i> why proteins having different amino acid sequences typically have different shapes and chemical properties.				
5. The genetic composition of cells can altered by incorporation of exogenous DNA into the cells. As a basis for understanding this concept:			X	X
5a. <i>Student know</i> the general structures and functions of DNA, RNA, and protein.			X	X
5b. <i>Student know</i> how to apply base-pairing rules to explain precise copying of DNA during semiconservative replication and transcription of information from DNA into mRNA.			X	X
5c. <i>Student know</i> how genetic engineering (biotechnology) is used to produce novel biomedical and agricultural products.				X
5d*. <i>Student know</i> how basic DNA technology (restriction digestion by endonucleases, gel electrophoresis, ligation, and transformation) is used to construct recombinant DNA molecules.				
5e*. <i>Student know</i> how exogenous DNA can be inserted into bacterial cells to alter their genetic makeup and support expression of new protein products.				
Ecology				
6. Stability in an ecosystem is a balance between competing effects. As a basis for understanding this concept:				X
6a. <i>Student know</i> biodiversity is the sum total of different kinds of organisms and affected by alterations of habitats.				X
6b. <i>Student know</i> how to analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of nonnative species, or changes in population				X

size.				
6c. <i>Students know</i> fluctuations in population size in an ecosystem are determined by the relative rates of birth, immigration, emigration, and death.				X
6d. <i>Student know</i> how water, carbon, and nitrogen cycle between abiotic resources and organic matter in the ecosystem and how oxygen cycles through photosynthesis and respiration.				X
6e. <i>Student know</i> a vital part of an ecosystem is the stability of its producers and decomposers.				X
6f. <i>Student know</i> at each link in a food web some energy is stored in newly made structures but much energy is dissipated into the environment as heat. This dissipation may be represented in an energy pyramid.				X
6g*. <i>Student know</i> how to distinguish between the accommodation of an individual organism to its environment and the gradual adaptation of a lineage of organisms through genetic change.				X
Evolution				
7. The frequency of an allele in a gene pool of population depends on many factors and may be stable of unstable over time. As a basis for understanding this concept:				X
7a. <i>Student know</i> why natural selection acts on the phenotype rather than the genotype of an organism.				X
7b. <i>Student know</i> why alleles that are lethal in a homozygous individual may be carried in a heterozygote and thus maintained in a gene pool.				X
7c. <i>Student know</i> new mutations are constantly being generated in gene pool.				X
7d. <i>Student know</i> variation within a species increase the likelihood that at least some members of species will survive under change environmental conditions.				X
7e*. <i>Student know</i> the conditions for Hardy-Weinberg equilibrium in a population and why these conditions are not likely to appear in nature.				
7f*. <i>Student know</i> how to solve the Hardy-Weinberg equation to predict the frequency of genotypes in a population, given the frequency of phenotypes.				
8. Evolution is the result of genetic changes that occur in constantly Changing environments. As a basis for understanding this concept:				X
8a. <i>Student know</i> how natural selection determines the				

differential survival of groups of organisms.				
8b. <i>Student know</i> a great diversity of species increases the chance that a least some organisms survive major changes in the environment.				X
8c. <i>Student know</i> the effects of genetic drift on the diversity of organisms in a population.				X
8d. <i>Student know</i> reproductive or geographic isolation affects speculation.				X
8e. <i>Student know</i> how to analyze fossil evidence with regard to biological diversity, episodic speculation, and mass extinction.				X
8f*. <i>Student know</i> how to use comparative embryology, DNA or protein sequence comparisons, and other independent sources of data to create a branching diagram (cladogram) that shows probable evolutionary relationships.				X
Physiology				
9. As result of the coordinated structures and functions of organ systems, the internal environment of the human body remains relatively stable (homeostatic) despite changes in the outside environment. As a basis for understanding this concept:				
9a. <i>Student know</i> how the complementary activity of major body systems provides cells with oxygen and nutrients and removes toxic waste products such as carbon dioxide.	X	X		
9b. <i>Student know</i> how the nervous system mediates communication between different parts of the body and the body's interactions with the environment.	X	X		
9c. <i>Student know</i> how feedback loops in the nervous and endocrine systems regulate conditions in the body.	X	X		
9d. <i>Student know</i> the function of the nervous system and the role of neurons in transmitting electrochemical impulses.	X	X		
9e. <i>Student know</i> the roles of sensory neurons, interneurons, and motor neurons in sensation, thought, and response.	X	X		
9f*. <i>Student know</i> the individual functions and sites of secretion of digestive enzymes (amylases, proteases, nucleases, lipases), stomach acid, and bile salts.	X	X		
9g*. <i>Students know</i> the homeostatic role of the kidneys in the removal of nitrogenous wastes and the role of the liver in blood detoxification and glucose balance.	X	X		
9h*. <i>Student know</i> the cellular and molecular basis of muscle contraction, including the roles of actin, myosin, Ca ²⁺ , and ATP.				
9i*. <i>Student know</i> how hormones (include				
10. Organisms have a verity of mechanisms to combat				

disease. As a basis for understanding the human immune response:				
10a. <i>Student know</i> the role of the skin in providing nonspecific defenses against infection.		X	X	
10b. <i>Student know</i> the role of antibodies in the body's response to infection		X	X	
10c. <i>Student know</i> how vaccination protects an individual from infections disease.		X	X	
10d. <i>Student know</i> there are important differences between bacteria and viruses with respect to their requirements for growth and replication, the body's primary defenses against bacteria and viral infections, and effective treatments of these infections.		X	X	
10e. <i>Student know</i> why individual with compromised immune system (for example, a person with AIDS) may be unable to fight off and survive infections by microorganisms that are usually benign.		X	X	
10f*. <i>Student know</i> the roles of phagocytes, B-lymphocytes, and T-lymphocytes in the immune system.				

III. Instructional Plan: Each general area of Life Science will be explored through texts, lab experiments, projects, videos...The textbook used covers the same curriculum as in the mainstream but readability is at a grade level more appropriate for students in this class. The mainstream text will be used as a group to supplement the main text. All material will be presented from a multimodal approach, including organizers, videos, charts/diagrams, games...

IV. Assessment:

Students' progress will be assessed through text questions, notebook, quizzes, tests, and oral and/or written papers and projects. Points will be assigned to each and the percentage of the total points will determine the grade.

When videos or games/activities are used for reinforcement of concepts, bonus points can often be earned toward the next test.

V. Texts: Biology, American Guidance Services (AGS), Circle Pines, Minnesota, 2000

Biology, Prentice Hall, Upper Saddle River, N.J., 2004

