

Molecular Biology Standards and Benchmarks

Standard 1: Understands and applies principles of scientific inquiry

*Power Benchmarks: Identifies questions and concepts that guide science investigations
Uses technology and mathematics to improve investigations and communications
Formulates and revises scientific explanations and models using logic and evidence
Recognizes and analyzes alternative explanations and models*

Course Level Benchmarks	Vocabulary	Knowledge	Skills	Classroom Resources
A. Formulates and revises scientific explanations and models	<ul style="list-style-type: none"> • scientific explanation • scientific model • data • within tolerance • scientific method 	<ul style="list-style-type: none"> • Knows scientific explanations and models are based on data • Knows new data may lead to the modification of scientific explanations and models 	<ul style="list-style-type: none"> • Analyzes data with respect to scientific explanations and models (ACT, SAT, ITED, AP BIO) • Adjusts scientific explanations and models based on data (ACT, SAT, ITED, AP BIO) 	Molecular Biology Curriculum Guide Emphasized throughout the entire curriculum <u>Technology:</u> Use of science to solve everyday problems
B. Understands how scientific knowledge changes with new evidence	<ul style="list-style-type: none"> • scientific knowledge • evidence • influence • ethics 	<ul style="list-style-type: none"> • Knows examples of scientific knowledge that changed when new evidence was presented • Knows that science is an ongoing process and is always open to new ideas 	<ul style="list-style-type: none"> • Describes how science concepts have evolved with the discovery of new evidence • Hypothesizes how current science concepts and practices will influence future societies 	
C. Uses technology and mathematics to perform accurate scientific investigations and communications	<ul style="list-style-type: none"> • technology • mathematics • probability • ratio • accuracy • scientific investigations • scientific communication • spreadsheets and graphs 	<ul style="list-style-type: none"> • Knows how technology can help scientific investigations and communications • Knows mathematical computations and formulas are essential to scientific investigations 	<ul style="list-style-type: none"> • Determines tools most appropriate to use given a particular situation • Uses the necessary mathematics for a particular situation (ACT, SAT, ITED, AP BIO) • Calculates results with a given degree of accuracy • Formulates graphic representation of data (ACT, SAT, ITED, AP BIO) 	
D. Demonstrates safe handling procedures	<ul style="list-style-type: none"> • OSHA • EPA • MSDS • Right to Know • hazardous • safety procedures 	<ul style="list-style-type: none"> • Knows appropriate safety procedures for a given situation • Knows where safety devices are located in the classroom • Understands the process of waste disposal 	<ul style="list-style-type: none"> • Follows required safety procedures • Recognizes, reports, and corrects safety problems • Follows waste disposal procedures 	

Molecular Biology Standards and Benchmarks

Standard 2: Understands and applies principles of life science

Power Benchmarks: Understands and applies knowledge of the cell
Understands and applies knowledge of the structure of atoms
Understands and applies knowledge of the structure and properties of atoms

Course Level Benchmarks	Vocabulary	Knowledge	Skills	Classroom Resources
A. Identifies and differentiates between the four molecules of life	<ul style="list-style-type: none"> • macromolecule • protein • organic • hydrolysis • carbohydrate • lipid • ionic bond • covalent bond • nucleic acid • dehydration synthesis • hydrolysis • homeostasis • pH • acid • base 	<ul style="list-style-type: none"> • Knows the differences between the four molecules of life • Knows the monomers of the macromolecules • Knows how all the macromolecules are made and broken down • Understands the roles of the macromolecules • Knows the characteristics of living things 	<ul style="list-style-type: none"> • Identifies the macromolecules based on physical properties • Models how the macromolecules are formed and broken • Lists the characteristics of life 	Molecular Biology Curriculum Guide Organic Molecules Labs pH Labs

Molecular Biology Standards and Benchmarks

Standard 2: Understands and applies principles of life science (con't)

Power Benchmarks: Understands and applies knowledge of the cell

Course Level Benchmarks	Vocabulary	Knowledge	Skills	Classroom Resources
B. Describes how cell processes contribute to the characteristics of organisms	<ul style="list-style-type: none"> • prokaryote • eukaryote • active transport • somate • cancer • osmosis • diffusion • cytokinesis • cell cycle • cell membrane • organelle • mitosis • meiosis • facilitated diffusion • passive transport • gamete 	<ul style="list-style-type: none"> • Knows plant and animal cells differ in basic structure and function • Know the difference between prokaryotes and eukaryotes • Knows the difference between games and somates • Understands the steps of cellular reproduction (mitosis and meiosis) • Knows how the cell cycle occurs and how it is regulated • Understands key organelles and their function • Knows the different forms of cellular transport 	<ul style="list-style-type: none"> • Identifies cellular structures and cell types under a microscope • Examines the steps of mitosis • Models principles of osmosis and diffusion 	Molecular Biology Curriculum Guide Cell Reproduction Activity Cell Identification Lab Permeability lab

Molecular Biology Standards and Benchmarks

Standard 2: Understands and applies principles of life science (con't)

*Power Benchmarks: Understands and applies knowledge of the cell
Understands and applies knowledge of matter, energy, and organization in living systems*

Course Level Benchmarks	Vocabulary	Knowledge	Skills	Classroom Resources
C. Describes how organisms obtain and use energy	<ul style="list-style-type: none"> • metabolism • photosynthesis • anaerobic respiration • aerobic respiration • fermentation • enzyme • thermodynamics • global warming • transpiration • xylem • phloem 	<ul style="list-style-type: none"> • Understands how energy is harvested within a cell • Knows how energy is stored within a cell • Understands how chemical reactions occur within a cell • Understands how products of photosynthesis are transported throughout a plant 	<ul style="list-style-type: none"> • Identifies the pathways of cellular respiration and photosynthesis (AP BIO) • Explains how enzymes function • Examines the structure of a plant and how materials are transported (AP BIO) 	<p style="text-align: center;">Molecular Biology Curriculum Guide</p> <p>ATP Activity Enzyme Lab Respiration Lab Photosynthesis Lab</p>

Molecular Biology Standards and Benchmarks

Standard 2: Understands and applies principles of life science (con't)

*Power Benchmarks: Understands and applies knowledge of the cell
Understands and applies knowledge of the molecular basis of heredity*

Course Level Benchmarks	Vocabulary	Knowledge	Skills	Classroom Resources
D. Investigates the form and function of DNA and its technological applications	<ul style="list-style-type: none"> • genotype • phenotype • homozygous • heterozygous • gene • allele • DNA • RNA • chromosome • translation • transcription • sex-linked • nucleotide • mutation • biotechnology 	<ul style="list-style-type: none"> • Knows cells store heredity information that is coded in DNA and stored on chromosomes • Knows the genetic information stored in DNA is used to direct the synthesis of proteins • Knows punnett squares and pedigrees predict patterns of inheritance • Knows how hereditary information is coded in DNA • Understands changes in DNA occur spontaneously and can be caused by external factors • Understands DNA can be manipulated through the process of biotechnology 	<ul style="list-style-type: none"> • Describes the types and results of change in organisms that mutations can produce • Uses molecular and Mendelian genetics (such as punnett squares and pedigrees) to solve problems • Models the process of protein synthesis 	<p style="text-align: center;">Molecular Biology Curriculum Guide</p> <p>Probability Lab Protein Synthesis Lab Mississippi Valley Regional Blood Center</p>

Molecular Biology Standards and Benchmarks

Standard 2: Understands and applies principles of life science (con't)

*Power Benchmarks: Understands and applies knowledge of biological evolution
Understands and applies knowledge of the behavior of organisms*

Course Level Benchmarks	Vocabulary	Knowledge	Skills	Classroom Resources
E. Explains how organisms adapt and change over time	<ul style="list-style-type: none"> • adaptation • natural selection • variation • evolution • species • homologous structures • analogous structures • vestigial structures • co-evolution • Darwin • fossils • extinction 	<ul style="list-style-type: none"> • Understands the difference between a variation and an adaptation • Understands species evolve and individuals do not • Knows mutations in organisms' sex cells may increase genetic variation within a species • Knows there is evidence that supports evolution 	<ul style="list-style-type: none"> • Describes the types and results of change in organisms that mutations can produce • Explains how some mutations may confer a selective advantage in a given environment • Explains and applies the theory of evolution by means of natural selection (AP BIO) 	<p>Molecular Biology Curriculum Guide</p> <p>PBS Evolution video series</p> <p>Evidence for Evolution Lab</p> <p>Natural Selection Lab</p>