

Inquiry Investigations™
Biotechnology Applications MODULE - 1278382
Grades: 7-10

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California Content Standards
Science
Grade 7

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| CONTENT STANDARD | CA.1. | Life Science: Cell Biology: All living organisms are composed of cells, from just one to many trillions, whose details usually are visible only through a microscope. As a basis for understanding this concept: |
| PERFORMANCE STANDARD | 1.c. | Students know the nucleus is the repository for genetic information in plant and animal cells. <ul style="list-style-type: none"> • Teacher Resource CD: Biotechnology in Medicine |
| PERFORMANCE STANDARD | 1.e. | Students know cells divide to increase their numbers through a process of mitosis, which results in two daughter cells with identical sets of chromosomes. <ul style="list-style-type: none"> • Virtual Laboratory: Preparation and Analysis of a Human Karyotype |
| CONTENT STANDARD | CA.2. | Life Science: Genetics: A typical cell of any organism contains genetic instructions that specify its traits. Those traits may be modified by environmental influences. As a basis for understanding this concept: |
| PERFORMANCE STANDARD | 2.a. | Students know the differences between the life cycles and reproduction methods of sexual and asexual organisms. <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 1 Activity 1: Genetically Modified Crops |
| PERFORMANCE STANDARD | 2.c. | Students know an inherited trait can be determined by one or more genes. <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 1 Activity 1: Genetically Modified Crops • Biotechnology Applications: Unit 2 Lab 4 Activity 1: Taking a Case History of Baby Mike • Biotechnology Applications: Unit 2 Lab 4 Activity 3: The Blue People of Troublesome Creek • Biotechnology Applications: Unit 2 Lab 4 Activity 4: Uncovering a Family Secret • Biotechnology Applications: Unit 2 Lab 4 Activity 5: Creating a Pedigree to Analyze a Family Trait • Teacher Resource CD: Biotechnology in Medicine |
| PERFORMANCE STANDARD | 2.d. | Students know plant and animal cells contain many thousands of different genes and typically have two copies of every gene. The two copies (or alleles) of the gene may or may not be identical, and one may be dominant in determining the phenotype while the other is recessive. <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 1 Activity 1: Genetically Modified |

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| | | <p>Crops</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 2 Lab 4 Activity 1: Taking a Case History of Baby Mike • Biotechnology Applications: Unit 2 Lab 4 Activity 3: The Blue People of Troublesome Creek • Biotechnology Applications: Unit 2 Lab 4 Activity 4: Uncovering a Family Secret • Biotechnology Applications: Unit 2 Lab 4 Activity 5: Creating a Pedigree to Analyze a Family Trait • Biotechnology Applications: Unit 3 Lab 6 Activity 1: Modeling DNA Profiles to Solve a Mystery • Biotechnology Applications: Unit 4 Lab 8 Activity 1: Case of the Second Examination • Biotechnology Applications: Unit 4 Lab 8 Activity 2: Finding Out Who Is at Risk for SARS • Teacher Resource CD: Biotechnology in Agriculture and the Environment • Teacher Resource CD: Biotechnology in Forensic Science • Teacher Resource CD: Biotechnology in Medicine |
| PERFORMANCE STANDARD | 2.e. | <p>Students know DNA (deoxyribonucleic acid) is the genetic material of living organisms and is located in the chromosomes of each cell.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 1 Activity 1: Genetically Modified Crops • Biotechnology Applications: Unit 2 Lab 4 Activity 1: Taking a Case History of Baby Mike • Biotechnology Applications: Unit 2 Lab 4 Activity 2: Analyzing Karyotypes • Biotechnology Applications: Unit 2 Lab 5 Activity 1: Diagnosing a Gene Defect • Biotechnology Applications: Unit 3 Lab 6 Activity 1: Modeling DNA Profiles to Solve a Mystery • Biotechnology Applications: Unit 3 Lab 7 Activity 1: Comparing Electrophoresed DNA Profiles • Biotechnology Applications: Unit 4 Lab 8 Activity 1: Case of the Second Examination • Biotechnology Applications: Unit 4 Lab 8 Activity 2: Finding Out Who Is at Risk for SARS • Teacher Resource CD: Biotechnology in Agriculture and the Environment • Teacher Resource CD: Biotechnology in Forensic Science • Teacher Resource CD: Biotechnology in Medicine • Virtual Laboratory: Preparation and Analysis of a Human Karyotype |
| CONTENT STANDARD | CA.3. | <p>Life Science: Evolution: Biological evolution accounts for the diversity of species developed through gradual processes over many generations. As a basis for understanding this concept:</p> |
| PERFORMANCE STANDARD | 3.a. | <p>Students know both genetic variation and environmental factors are causes of evolution and diversity of organisms.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 2 Lab 4 Activity 1: Taking a Case History of Baby Mike • Biotechnology Applications: Unit 2 Lab 4 Activity 2: Analyzing Karyotypes • Biotechnology Applications: Unit 2 Lab 4 Activity 3: The Blue People of Troublesome Creek • Biotechnology Applications: Unit 2 Lab 4 Activity 4: Uncovering a Family Secret |

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| | | <ul style="list-style-type: none"> • Biotechnology Applications: Unit 2 Lab 4 Activity 5: Creating a Pedigree to Analyze a Family Trait |
| CONTENT STANDARD | CA.5. | Life Science: Structure and Function in Living Systems: The anatomy and physiology of plants and animals illustrate the complementary nature of structure and function. As a basis for understanding this concept: |
| PERFORMANCE STANDARD | 5.f. | <p>Students know the structures and processes by which flowering plants generate pollen, ovules, seeds, and fruit.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 1 Activity 1: Genetically Modified Crops |
| CONTENT STANDARD | CA.7. | Life Science: Investigation and Experimentation: Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will: |
| PERFORMANCE STANDARD | 7.a. | <p>Select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 1 Activity 1: Genetically Modified Crops • Biotechnology Applications: Unit 1 Lab 2 Activity 1: Making Cheese the Biotech Way • Biotechnology Applications: Unit 1 Lab 3 Activity 1: Biodegrading a Simulated Oil Spill • Biotechnology Applications: Unit 1 Lab 3 Activity 2: Cleaning up Mini-Oil Spills in Various Shore Environments • Biotechnology Applications: Unit 1 Lab 3 Activity 3: Examining Oil-Degrading Microbes • Biotechnology Applications: Unit 2 Lab 4 Activity 1: Taking a Case History of Baby Mike • Biotechnology Applications: Unit 2 Lab 4 Activity 2: Analyzing Karyotypes • Biotechnology Applications: Unit 2 Lab 4 Activity 3: The Blue People of Troublesome Creek • Biotechnology Applications: Unit 2 Lab 4 Activity 4: Uncovering a Family Secret • Biotechnology Applications: Unit 2 Lab 4 Activity 5: Creating a Pedigree to Analyze a Family Trait • Biotechnology Applications: Unit 2 Lab 5 Activity 1: Diagnosing a Gene Defect • Biotechnology Applications: Unit 3 Lab 6 Activity 1: Modeling DNA Profiles to Solve a Mystery • Biotechnology Applications: Unit 3 Lab 7 Activity 1: Comparing Electrophoresed DNA Profiles • Biotechnology Applications: Unit 4 Lab 8 Activity 1: Case of the Second Examination • Biotechnology Applications: Unit 4 Lab 8 Activity 2: Finding Out Who Is at Risk for SARS • Virtual Laboratory: Preparation and Analysis of a Human Karyotype |
| PERFORMANCE STANDARD | 7.b. | Use a variety of print and electronic resources (including the World Wide Web) to collect information and evidence as part of a research project. |

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| | | <ul style="list-style-type: none"> Virtual Laboratory: Preparation and Analysis of a Human Karyotype |
| PERFORMANCE STANDARD | 7.c. | <p>Communicate the logical connection among hypotheses, science concepts, tests conducted, data collected, and conclusions drawn from the scientific evidence.</p> <ul style="list-style-type: none"> Biotechnology Applications: Unit 1 Lab 1 Activity 1: Genetically Modified Crops Biotechnology Applications: Unit 1 Lab 2 Activity 1: Making Cheese the Biotech Way Biotechnology Applications: Unit 1 Lab 3 Activity 1: Biodegrading a Simulated Oil Spill Biotechnology Applications: Unit 1 Lab 3 Activity 2: Cleaning up Mini-Oil Spills in Various Shore Environments Biotechnology Applications: Unit 1 Lab 3 Activity 3: Examining Oil-Degrading Microbes Biotechnology Applications: Unit 2 Lab 4 Activity 1: Taking a Case History of Baby Mike Biotechnology Applications: Unit 2 Lab 4 Activity 2: Analyzing Karyotypes Biotechnology Applications: Unit 2 Lab 4 Activity 3: The Blue People of Troublesome Creek Biotechnology Applications: Unit 2 Lab 4 Activity 4: Uncovering a Family Secret Biotechnology Applications: Unit 2 Lab 4 Activity 5: Creating a Pedigree to Analyze a Family Trait Biotechnology Applications: Unit 2 Lab 5 Activity 1: Diagnosing a Gene Defect Biotechnology Applications: Unit 3 Lab 6 Activity 1: Modeling DNA Profiles to Solve a Mystery Biotechnology Applications: Unit 3 Lab 7 Activity 1: Comparing Electrophoresed DNA Profiles Biotechnology Applications: Unit 4 Lab 8 Activity 1: Case of the Second Examination Biotechnology Applications: Unit 4 Lab 8 Activity 2: Finding Out Who Is at Risk for SARS Virtual Laboratory: Preparation and Analysis of a Human Karyotype |
| PERFORMANCE STANDARD | 7.d. | <p>Construct scale models, maps, and appropriately labeled diagrams to communicate scientific knowledge (e.g., motion of Earth's plates and cell structure).</p> <ul style="list-style-type: none"> Biotechnology Applications: Unit 1 Lab 3 Activity 2: Cleaning up Mini-Oil Spills in Various Shore Environments Biotechnology Applications: Unit 2 Lab 5 Activity 1: Diagnosing a Gene Defect Biotechnology Applications: Unit 3 Lab 6 Activity 1: Modeling DNA Profiles to Solve a Mystery Biotechnology Applications: Unit 3 Lab 7 Activity 1: Comparing Electrophoresed DNA Profiles Biotechnology Applications: Unit 4 Lab 8 Activity 1: Case of the Second Examination |
| PERFORMANCE STANDARD | 7.e. | <p>Communicate the steps and results from an investigation in written reports and oral presentations.</p> <ul style="list-style-type: none"> Biotechnology Applications: Unit 1 Lab 1 Activity 1: Genetically Modified Crops |

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| | | <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 2 Activity 1: Making Cheese the Biotech Way • Biotechnology Applications: Unit 1 Lab 3 Activity 1: Biodegrading a Simulated Oil Spill • Biotechnology Applications: Unit 1 Lab 3 Activity 2: Cleaning up Mini-Oil Spills in Various Shore Environments • Biotechnology Applications: Unit 1 Lab 3 Activity 3: Examining Oil-Degrading Microbes • Biotechnology Applications: Unit 2 Lab 4 Activity 1: Taking a Case History of Baby Mike • Biotechnology Applications: Unit 2 Lab 4 Activity 2: Analyzing Karyotypes • Biotechnology Applications: Unit 2 Lab 4 Activity 3: The Blue People of Troublesome Creek • Biotechnology Applications: Unit 2 Lab 4 Activity 4: Uncovering a Family Secret • Biotechnology Applications: Unit 2 Lab 4 Activity 5: Creating a Pedigree to Analyze a Family Trait • Biotechnology Applications: Unit 2 Lab 5 Activity 1: Diagnosing a Gene Defect • Biotechnology Applications: Unit 3 Lab 6 Activity 1: Modeling DNA Profiles to Solve a Mystery • Biotechnology Applications: Unit 3 Lab 7 Activity 1: Comparing Electrophoresed DNA Profiles • Biotechnology Applications: Unit 4 Lab 8 Activity 1: Case of the Second Examination • Biotechnology Applications: Unit 4 Lab 8 Activity 2: Finding Out Who Is at Risk for SARS • Virtual Laboratory: Preparation and Analysis of a Human Karyotype |
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**California Content Standards
Science
Grade 8**

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| CONTENT STANDARD | CA.5. | Physical Science: Reactions: Chemical reactions are processes in which atoms are rearranged into different combinations of molecules. As a basis for understanding this concept: |
| PERFORMANCE STANDARD | 5.e. | <p>Students know how to determine whether a solution is acidic, basic, or neutral.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 2 Activity 1: Making Cheese the Biotech Way |
| CONTENT STANDARD | CA.9. | Physical Science: Investigation and Experimentation: Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will: |
| PERFORMANCE STANDARD | 9.d. | <p>Recognize the slope of the linear graph as the constant in the relationship $y = kx$ and apply this principle in interpreting graphs constructed from data.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 3 Lab 7 Activity 1: Comparing Electrophoresed DNA Profiles • Biotechnology Applications: Unit 4 Lab 8 Activity 1: Case of the Second Examination |
| PERFORMANCE STANDARD | 9.e. | Construct appropriate graphs from data and develop quantitative statements about the relationships between variables. |

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| | | <ul style="list-style-type: none"> • Biotechnology Applications: Unit 3 Lab 7 Activity 1: Comparing Electrophoresed DNA Profiles • Biotechnology Applications: Unit 4 Lab 8 Activity 1: Case of the Second Examination |
| PERFORMANCE STANDARD | 9.g. | <p>Distinguish between linear and nonlinear relationships on a graph of data.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 3 Lab 7 Activity 1: Comparing Electrophoresed DNA Profiles • Biotechnology Applications: Unit 4 Lab 8 Activity 1: Case of the Second Examination |

**California Content Standards
Science
Grade 9**

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| CONTENT STANDARD | CA.5. | Chemistry: Acids and Bases: Acids, bases, and salts are three classes of compounds that form ions in water solutions. As a basis for understanding this concept: |
| PERFORMANCE STANDARD | 5.d. | <p>Students know how to use the pH scale to characterize acid and base solutions.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 2 Activity 1: Making Cheese the Biotech Way |
| PERFORMANCE STANDARD | 5.f. | <p>Students know how to calculate pH from the hydrogen-ion concentration.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 2 Activity 1: Making Cheese the Biotech Way |
| PERFORMANCE STANDARD | 5.g. | <p>Students know buffers stabilize pH in acid-base reactions.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 2 Lab 5 Activity 1: Diagnosing a Gene Defect |
| CONTENT STANDARD | CA.10. | Chemistry: Organic Chemistry and Biochemistry: The bonding characteristics of carbon allow the formation of many different organic molecules of varied sizes, shapes, and chemical properties and provide the biochemical basis of life. As a basis for understanding this concept: |
| PERFORMANCE STANDARD | 10.a. | <p>Students know large molecules (polymers), such as proteins, nucleic acids, and starch, are formed by repetitive combinations of simple subunits.</p> <ul style="list-style-type: none"> • Teacher Resource CD: Biotechnology in Agriculture and the Environment • Teacher Resource CD: Biotechnology in Medicine |
| CONTENT STANDARD | CA.1. | Biology/Life Sciences: Cell Biology: The fundamental life processes of plants and animals depend on a variety of chemical reactions that occur in specialized areas of the organism's cells. As a basis for understanding this concept: |
| PERFORMANCE STANDARD | 1.b. | <p>Students know enzymes are proteins that catalyze biochemical reactions without altering the reaction equilibrium and the activities of enzymes depend on the temperature, ionic conditions, and the pH of the surroundings.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 2 Activity 1: Making Cheese the Biotech Way • Biotechnology Applications: Unit 4 Lab 8 Activity 1: Case of the Second |

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| | | <p>Examination</p> <ul style="list-style-type: none"> Teacher Resource CD: Biotechnology in Agriculture and the Environment Teacher Resource CD: Biotechnology in Forensic Science |
| CONTENT STANDARD | CA.2. | Biology/Life Sciences: Genetics: Mutation and sexual reproduction lead to genetic variation in a population. As a basis for understanding this concept: |
| PERFORMANCE STANDARD | 2.f. | <p>Students know the role of chromosomes in determining an individual's sex.</p> <ul style="list-style-type: none"> Teacher Resource CD: Biotechnology in Medicine |
| PERFORMANCE STANDARD | 2.g. | <p>Students know how to predict possible combinations of alleles in a zygote from the genetic makeup of the parents.</p> <ul style="list-style-type: none"> Biotechnology Applications: Unit 2 Lab 5 Activity 1: Diagnosing a Gene Defect Teacher Resource CD: Biotechnology in Forensic Science |
| CONTENT STANDARD | CA.3. | Biology/Life Sciences: Genetics: A multicellular organism develops from a single zygote, and its phenotype depends on its genotype, which is established at fertilization. As a basis for understanding this concept: |
| PERFORMANCE STANDARD | 3.a. | <p>Students know how to predict the probable outcome of phenotypes in a genetic cross from the genotypes of the parents and mode of inheritance (autosomal or X-linked, dominant or recessive).</p> <ul style="list-style-type: none"> Biotechnology Applications: Unit 1 Lab 1 Activity 1: Genetically Modified Crops Biotechnology Applications: Unit 2 Lab 4 Activity 1: Taking a Case History of Baby Mike Biotechnology Applications: Unit 2 Lab 4 Activity 3: The Blue People of Troublesome Creek Biotechnology Applications: Unit 2 Lab 4 Activity 4: Uncovering a Family Secret Biotechnology Applications: Unit 2 Lab 4 Activity 5: Creating a Pedigree to Analyze a Family Trait Biotechnology Applications: Unit 2 Lab 5 Activity 1: Diagnosing a Gene Defect Biotechnology Applications: Unit 4 Lab 8 Activity 2: Finding Out Who Is at Risk for SARS Teacher Resource CD: Biotechnology in Agriculture and the Environment Teacher Resource CD: Biotechnology in Forensic Science Teacher Resource CD: Biotechnology in Medicine |
| PERFORMANCE STANDARD | 3.c. | <p>Students know how to predict the probable mode of inheritance from a pedigree diagram showing phenotypes.</p> <ul style="list-style-type: none"> Biotechnology Applications: Unit 2 Lab 4 Activity 4: Uncovering a Family Secret Biotechnology Applications: Unit 2 Lab 4 Activity 5: Creating a Pedigree to Analyze a Family Trait Teacher Resource CD: Biotechnology in Medicine |
| PERFORMANCE STANDARD | 3.d. | Students know how to use data on frequency of recombination at meiosis to estimate |

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| | | <p>genetic distances between loci and to interpret genetic maps of chromosomes.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 2 Lab 4 Activity 2: Analyzing Karyotypes • Biotechnology Applications: Unit 2 Lab 4 Activity 3: The Blue People of Troublesome Creek • Teacher Resource CD: Biotechnology in Medicine • Virtual Laboratory: Preparation and Analysis of a Human Karyotype |
| CONTENT STANDARD | CA.4. | Biology/Life Sciences: Genetics: Genes are a 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 understanding this concept: |
| PERFORMANCE STANDARD | 4.c. | <p>Students know how mutations in the DNA sequence of a gene may or may not affect the expression of the gene or the sequence of amino acids in an encoded protein.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 2 Lab 4 Activity 2: Analyzing Karyotypes • Biotechnology Applications: Unit 4 Lab 8 Activity 1: Case of the Second Examination • Teacher Resource CD: Biotechnology in Medicine |
| PERFORMANCE STANDARD | 4.d. | <p>Students know specialization of cells in multicellular organisms is usually due to different patterns of gene expression rather than to differences of the genes themselves.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 4 Lab 8 Activity 1: Case of the Second Examination |
| CONTENT STANDARD | CA.5. | Biology/Life Sciences: Genetics: The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells. As a basis for understanding this concept: |
| PERFORMANCE STANDARD | 5.a. | <p>Students know the general structures and functions of DNA, RNA, and protein.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 1 Activity 1: Genetically Modified Crops • Biotechnology Applications: Unit 3 Lab 6 Activity 1: Modeling DNA Profiles to Solve a Mystery • Biotechnology Applications: Unit 3 Lab 7 Activity 1: Comparing Electrophoresed DNA Profiles • Biotechnology Applications: Unit 4 Lab 8 Activity 1: Case of the Second Examination • Biotechnology Applications: Unit 4 Lab 8 Activity 2: Finding Out Who Is at Risk for SARS • Teacher Resource CD: Biotechnology in Agriculture and the Environment • Teacher Resource CD: Biotechnology in Forensic Science • Teacher Resource CD: Biotechnology in Medicine |
| PERFORMANCE STANDARD | 5.c. | <p>Students know how genetic engineering (biotechnology) is used to produce novel biomedical and agricultural products.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 1 Activity 1: Genetically Modified Crops • Biotechnology Applications: Unit 1 Lab 2 Activity 1: Making Cheese the |

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| | | <p>Biotech Way</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 3 Activity 1: Biodegrading a Simulated Oil Spill • Biotechnology Applications: Unit 1 Lab 3 Activity 3: Examining Oil-Degrading Microbes • Biotechnology Applications: Unit 2 Lab 4 Activity 1: Taking a Case History of Baby Mike • Biotechnology Applications: Unit 2 Lab 4 Activity 2: Analyzing Karyotypes • Biotechnology Applications: Unit 2 Lab 4 Activity 3: The Blue People of Troublesome Creek • Biotechnology Applications: Unit 2 Lab 4 Activity 4: Uncovering a Family Secret • Biotechnology Applications: Unit 2 Lab 4 Activity 5: Creating a Pedigree to Analyze a Family Trait • Biotechnology Applications: Unit 2 Lab 5 Activity 1: Diagnosing a Gene Defect • Biotechnology Applications: Unit 3 Lab 6 Activity 1: Modeling DNA Profiles to Solve a Mystery • Biotechnology Applications: Unit 3 Lab 7 Activity 1: Comparing Electrophoresed DNA Profiles • Biotechnology Applications: Unit 4 Lab 8 Activity 2: Finding Out Who Is at Risk for SARS • Teacher Resource CD: Biotechnology in Agriculture and the Environment • Teacher Resource CD: Biotechnology in Forensic Science • Teacher Resource CD: Biotechnology in Medicine |
| PERFORMANCE STANDARD | 5.d. | <p>Students know how basic DNA technology (restriction digestion by endonucleases, gel electrophoresis, ligation, and transformation) is used to construct recombinant DNA molecules.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 1 Activity 1: Genetically Modified Crops • Biotechnology Applications: Unit 1 Lab 3 Activity 1: Biodegrading a Simulated Oil Spill • Biotechnology Applications: Unit 3 Lab 6 Activity 1: Modeling DNA Profiles to Solve a Mystery • Teacher Resource CD: Biotechnology in Agriculture and the Environment • Teacher Resource CD: Biotechnology in Forensic Science • Teacher Resource CD: Biotechnology in Medicine |
| PERFORMANCE STANDARD | 5.e. | <p>Students know how exogenous DNA can be inserted into bacterial cells to alter their genetic makeup and support expression of new protein products.</p> <ul style="list-style-type: none"> • Teacher Resource CD: Biotechnology in Agriculture and the Environment |
| CONTENT STANDARD | CA.6. | <p>Biology/Life Sciences: Ecology: Stability in an ecosystem is a balance between competing effects. As a basis for understanding this concept:</p> |
| PERFORMANCE STANDARD | 6.a. | <p>Students know biodiversity is the sum total of different kinds of organisms and is affected by alterations of habitats.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 3 Lab 6 Activity 1: Modeling DNA |

| | | Profiles to Solve a Mystery |
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| PERFORMANCE STANDARD | 6.b. | <p>Students know how to analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of nonnative species, or changes in population size.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 3 Activity 1: Biodegrading a Simulated Oil Spill • Biotechnology Applications: Unit 1 Lab 3 Activity 2: Cleaning up Mini-Oil Spills in Various Shore Environments • Biotechnology Applications: Unit 1 Lab 3 Activity 3: Examining Oil-Degrading Microbes |
| PERFORMANCE STANDARD | 6.c. | <p>Students know how fluctuations in population size in an ecosystem are determined by the relative rates of birth, immigration, emigration, and death.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 3 Activity 1: Biodegrading a Simulated Oil Spill • Biotechnology Applications: Unit 1 Lab 3 Activity 2: Cleaning up Mini-Oil Spills in Various Shore Environments • Biotechnology Applications: Unit 1 Lab 3 Activity 3: Examining Oil-Degrading Microbes • Biotechnology Applications: Unit 2 Lab 4 Activity 3: The Blue People of Troublesome Creek |
| CONTENT STANDARD | CA.7. | Biology/Life Sciences: Evolution: The frequency of an allele in a gene pool of a population depends on many factors and may be stable or unstable over time. As a basis for understanding this concept: |
| PERFORMANCE STANDARD | 7.b. | <p>Students know why alleles that are lethal in a homozygous individual may be carried in a heterozygote and thus maintained in a gene pool.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 2 Lab 4 Activity 1: Taking a Case History of Baby Mike • Biotechnology Applications: Unit 2 Lab 4 Activity 2: Analyzing Karyotypes • Biotechnology Applications: Unit 2 Lab 4 Activity 3: The Blue People of Troublesome Creek • Biotechnology Applications: Unit 2 Lab 4 Activity 4: Uncovering a Family Secret • Biotechnology Applications: Unit 2 Lab 4 Activity 5: Creating a Pedigree to Analyze a Family Trait • Biotechnology Applications: Unit 2 Lab 5 Activity 1: Diagnosing a Gene Defect • Biotechnology Applications: Unit 4 Lab 8 Activity 1: Case of the Second Examination • Teacher Resource CD: Biotechnology in Medicine • Virtual Laboratory: Preparation and Analysis of a Human Karyotype |
| PERFORMANCE STANDARD | 7.c. | <p>Students know new mutations are constantly being generated in a gene pool.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 2 Lab 4 Activity 2: Analyzing Karyotypes • Teacher Resource CD: Biotechnology in Medicine |
| CONTENT | CA.8. | Biology/Life Sciences: Evolution: Evolution is the result of genetic changes that |

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| STANDARD | | occur in constantly changing environments. As a basis for understanding this concept: |
| PERFORMANCE STANDARD | 8.b. | Students know a great diversity of species increases the chance that at least some organisms survive major changes in the environment. <ul style="list-style-type: none"> • Biotechnology Applications: Unit 3 Lab 6 Activity 1: Modeling DNA Profiles to Solve a Mystery |
| CONTENT STANDARD | CA.10. | Biology/Life Sciences: Physiology: Organisms have a variety of mechanisms to combat disease. As a basis for understanding the human immune response: |
| PERFORMANCE STANDARD | 10.c. | Students know how vaccination protects an individual from infectious diseases. <ul style="list-style-type: none"> • Teacher Resource CD: Biotechnology in Agriculture and the Environment |
| PERFORMANCE STANDARD | 10.d. | Students know there are important differences between bacteria and viruses with respect to their requirements for growth and replication, the body's primary defenses against bacterial and viral infections, and effective treatments of these infections. <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 2 Activity 1: Making Cheese the Biotech Way • Biotechnology Applications: Unit 1 Lab 3 Activity 1: Biodegrading a Simulated Oil Spill • Biotechnology Applications: Unit 1 Lab 3 Activity 2: Cleaning up Mini-Oil Spills in Various Shore Environments • Biotechnology Applications: Unit 1 Lab 3 Activity 3: Examining Oil-Degrading Microbes • Biotechnology Applications: Unit 4 Lab 8 Activity 1: Case of the Second Examination • Biotechnology Applications: Unit 4 Lab 8 Activity 2: Finding Out Who Is at Risk for SARS |
| PERFORMANCE STANDARD | 10.e. | Students know why an individual with a compromised immune system (for example, a person with AIDS) may be unable to fight off and survive infections by microorganisms that are usually benign. <ul style="list-style-type: none"> • Biotechnology Applications: Unit 4 Lab 8 Activity 1: Case of the Second Examination • Biotechnology Applications: Unit 4 Lab 8 Activity 2: Finding Out Who Is at Risk for SARS |
| CONTENT STANDARD | CA.9. | Earth Sciences: California Geology: The geology of California underlies the state's wealth of natural resources as well as its natural hazards. As a basis for understanding this concept: |
| PERFORMANCE STANDARD | 9.a. | Students know the resources of major economic importance in California and their relation to California's geology. <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 3 Activity 1: Biodegrading a Simulated Oil Spill • Biotechnology Applications: Unit 1 Lab 3 Activity 2: Cleaning up Mini-Oil Spills in Various Shore Environments • Biotechnology Applications: Unit 1 Lab 3 Activity 3: Examining Oil-Degrading Microbes |
| CONTENT | CA.1. | Investigation and Experimentation: Scientific progress is made by asking |

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| STANDARD | | meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop their own questions and perform investigations. Students will: |
| PERFORMANCE STANDARD | 1.a. | <p>Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 1 Activity 1: Genetically Modified Crops • Biotechnology Applications: Unit 1 Lab 2 Activity 1: Making Cheese the Biotech Way • Biotechnology Applications: Unit 1 Lab 3 Activity 1: Biodegrading a Simulated Oil Spill • Biotechnology Applications: Unit 1 Lab 3 Activity 2: Cleaning up Mini-Oil Spills in Various Shore Environments • Biotechnology Applications: Unit 1 Lab 3 Activity 3: Examining Oil-Degrading Microbes • Biotechnology Applications: Unit 2 Lab 4 Activity 1: Taking a Case History of Baby Mike • Biotechnology Applications: Unit 2 Lab 4 Activity 2: Analyzing Karyotypes • Biotechnology Applications: Unit 2 Lab 4 Activity 3: The Blue People of Troublesome Creek • Biotechnology Applications: Unit 2 Lab 4 Activity 4: Uncovering a Family Secret • Biotechnology Applications: Unit 2 Lab 4 Activity 5: Creating a Pedigree to Analyze a Family Trait • Biotechnology Applications: Unit 2 Lab 5 Activity 1: Diagnosing a Gene Defect • Biotechnology Applications: Unit 3 Lab 6 Activity 1: Modeling DNA Profiles to Solve a Mystery • Biotechnology Applications: Unit 3 Lab 7 Activity 1: Comparing Electrophoresed DNA Profiles • Biotechnology Applications: Unit 4 Lab 8 Activity 1: Case of the Second Examination • Biotechnology Applications: Unit 4 Lab 8 Activity 2: Finding Out Who Is at Risk for SARS • Virtual Laboratory: Preparation and Analysis of a Human Karyotype |
| PERFORMANCE STANDARD | 1.g. | <p>Recognize the usefulness and limitations of models and theories as scientific representations of reality.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 3 Activity 2: Cleaning up Mini-Oil Spills in Various Shore Environments • Biotechnology Applications: Unit 3 Lab 6 Activity 1: Modeling DNA Profiles to Solve a Mystery |
| PERFORMANCE STANDARD | 1.i. | <p>Analyze the locations, sequences, or time intervals that are characteristic of natural phenomena (e.g., relative ages of rocks, locations of planets over time, and succession of species in an ecosystem).</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 2 Lab 4 Activity 2: Analyzing Karyotypes • Biotechnology Applications: Unit 3 Lab 6 Activity 1: Modeling DNA Profiles to Solve a Mystery |

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| | | <ul style="list-style-type: none"> • Biotechnology Applications: Unit 3 Lab 7 Activity 1: Comparing Electrophoresed DNA Profiles • Biotechnology Applications: Unit 4 Lab 8 Activity 1: Case of the Second Examination • Biotechnology Applications: Unit 4 Lab 8 Activity 2: Finding Out Who Is at Risk for SARS |
| PERFORMANCE STANDARD | 1.j. | <p>Recognize the issues of statistical variability and the need for controlled tests.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 2 Lab 5 Activity 1: Diagnosing a Gene Defect |
| PERFORMANCE STANDARD | 1.k. | <p>Recognize the cumulative nature of scientific evidence.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 1 Activity 1: Genetically Modified Crops • Biotechnology Applications: Unit 2 Lab 4 Activity 1: Taking a Case History of Baby Mike • Biotechnology Applications: Unit 2 Lab 4 Activity 2: Analyzing Karyotypes • Biotechnology Applications: Unit 2 Lab 4 Activity 3: The Blue People of Troublesome Creek • Biotechnology Applications: Unit 2 Lab 4 Activity 4: Uncovering a Family Secret • Biotechnology Applications: Unit 2 Lab 4 Activity 5: Creating a Pedigree to Analyze a Family Trait |
| PERFORMANCE STANDARD | 1.l. | <p>Analyze situations and solve problems that require combining and applying concepts from more than one area of science.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 1 Activity 1: Genetically Modified Crops • Biotechnology Applications: Unit 1 Lab 2 Activity 1: Making Cheese the Biotech Way • Biotechnology Applications: Unit 1 Lab 3 Activity 1: Biodegrading a Simulated Oil Spill • Biotechnology Applications: Unit 1 Lab 3 Activity 2: Cleaning up Mini-Oil Spills in Various Shore Environments • Biotechnology Applications: Unit 1 Lab 3 Activity 3: Examining Oil-Degrading Microbes • Biotechnology Applications: Unit 2 Lab 4 Activity 1: Taking a Case History of Baby Mike • Biotechnology Applications: Unit 2 Lab 4 Activity 2: Analyzing Karyotypes • Biotechnology Applications: Unit 2 Lab 4 Activity 3: The Blue People of Troublesome Creek • Biotechnology Applications: Unit 2 Lab 4 Activity 4: Uncovering a Family Secret • Biotechnology Applications: Unit 2 Lab 4 Activity 5: Creating a Pedigree to Analyze a Family Trait • Biotechnology Applications: Unit 2 Lab 5 Activity 1: Diagnosing a Gene Defect • Biotechnology Applications: Unit 3 Lab 6 Activity 1: Modeling DNA Profiles to Solve a Mystery • Biotechnology Applications: Unit 3 Lab 7 Activity 1: Comparing |

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| | | <p>Electrophoresed DNA Profiles</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 4 Lab 8 Activity 1: Case of the Second Examination • Biotechnology Applications: Unit 4 Lab 8 Activity 2: Finding Out Who Is at Risk for SARS |
| PERFORMANCE STANDARD | 1.m. | <p>Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. Examples of issues include irradiation of food, cloning of animals by somatic cell nuclear transfer, choice of energy sources, and land and water use decisions in California.</p> <ul style="list-style-type: none"> • Teacher Resource CD: Biotechnology in Agriculture and the Environment • Teacher Resource CD: Biotechnology in Forensic Science • Teacher Resource CD: Biotechnology in Medicine |

**California Content Standards
Science
Grade 10**

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| CONTENT STANDARD | CA.5. | Chemistry: Acids and Bases: Acids, bases, and salts are three classes of compounds that form ions in water solutions. As a basis for understanding this concept: |
| PERFORMANCE STANDARD | 5.d. | <p>Students know how to use the pH scale to characterize acid and base solutions.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 2 Activity 1: Making Cheese the Biotech Way |
| PERFORMANCE STANDARD | 5.f. | <p>Students know how to calculate pH from the hydrogen-ion concentration.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 2 Activity 1: Making Cheese the Biotech Way |
| PERFORMANCE STANDARD | 5.g. | <p>Students know buffers stabilize pH in acid-base reactions.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 2 Lab 5 Activity 1: Diagnosing a Gene Defect |
| CONTENT STANDARD | CA.10. | Chemistry: Organic Chemistry and Biochemistry: The bonding characteristics of carbon allow the formation of many different organic molecules of varied sizes, shapes, and chemical properties and provide the biochemical basis of life. As a basis for understanding this concept: |
| PERFORMANCE STANDARD | 10.a. | <p>Students know large molecules (polymers), such as proteins, nucleic acids, and starch, are formed by repetitive combinations of simple subunits.</p> <ul style="list-style-type: none"> • Teacher Resource CD: Biotechnology in Agriculture and the Environment • Teacher Resource CD: Biotechnology in Medicine |
| CONTENT STANDARD | CA.1. | Biology/Life Sciences: Cell Biology: The fundamental life processes of plants and animals depend on a variety of chemical reactions that occur in specialized areas of the organism's cells. As a basis for understanding this concept: |
| PERFORMANCE STANDARD | 1.b. | <p>Students know enzymes are proteins that catalyze biochemical reactions without altering the reaction equilibrium and the activities of enzymes depend on the</p> |

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| | | <p>temperature, ionic conditions, and the pH of the surroundings.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 2 Activity 1: Making Cheese the Biotech Way • Biotechnology Applications: Unit 4 Lab 8 Activity 1: Case of the Second Examination • Teacher Resource CD: Biotechnology in Agriculture and the Environment • Teacher Resource CD: Biotechnology in Forensic Science |
| CONTENT STANDARD | CA.2. | Biology/Life Sciences: Genetics: Mutation and sexual reproduction lead to genetic variation in a population. As a basis for understanding this concept: |
| PERFORMANCE STANDARD | 2.f. | <p>Students know the role of chromosomes in determining an individual's sex.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 2 Lab 4 Activity 1: Taking a Case History of Baby Mike • Biotechnology Applications: Unit 2 Lab 4 Activity 2: Analyzing Karyotypes • Teacher Resource CD: Biotechnology in Forensic Science • Teacher Resource CD: Biotechnology in Medicine • Virtual Laboratory: Preparation and Analysis of a Human Karyotype |
| PERFORMANCE STANDARD | 2.g. | <p>Students know how to predict possible combinations of alleles in a zygote from the genetic makeup of the parents.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 2 Lab 5 Activity 1: Diagnosing a Gene Defect • Teacher Resource CD: Biotechnology in Forensic Science |
| CONTENT STANDARD | CA.3. | Biology/Life Sciences: Genetics: A multicellular organism develops from a single zygote, and its phenotype depends on its genotype, which is established at fertilization. As a basis for understanding this concept: |
| PERFORMANCE STANDARD | 3.a. | <p>Students know how to predict the probable outcome of phenotypes in a genetic cross from the genotypes of the parents and mode of inheritance (autosomal or X-linked, dominant or recessive).</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 1 Activity 1: Genetically Modified Crops • Biotechnology Applications: Unit 2 Lab 4 Activity 1: Taking a Case History of Baby Mike • Biotechnology Applications: Unit 2 Lab 4 Activity 3: The Blue People of Troublesome Creek • Biotechnology Applications: Unit 2 Lab 4 Activity 4: Uncovering a Family Secret • Biotechnology Applications: Unit 2 Lab 4 Activity 5: Creating a Pedigree to Analyze a Family Trait • Biotechnology Applications: Unit 2 Lab 5 Activity 1: Diagnosing a Gene Defect • Biotechnology Applications: Unit 4 Lab 8 Activity 2: Finding Out Who Is at Risk for SARS • Teacher Resource CD: Biotechnology in Agriculture and the Environment • Teacher Resource CD: Biotechnology in Forensic Science • Teacher Resource CD: Biotechnology in Medicine |

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| PERFORMANCE STANDARD | 3.c. | <p>Students know how to predict the probable mode of inheritance from a pedigree diagram showing phenotypes.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 2 Lab 4 Activity 4: Uncovering a Family Secret • Biotechnology Applications: Unit 2 Lab 4 Activity 5: Creating a Pedigree to Analyze a Family Trait • Teacher Resource CD: Biotechnology in Medicine |
| PERFORMANCE STANDARD | 3.d. | <p>Students know how to use data on frequency of recombination at meiosis to estimate genetic distances between loci and to interpret genetic maps of chromosomes.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 2 Lab 4 Activity 1: Taking a Case History of Baby Mike • Biotechnology Applications: Unit 2 Lab 4 Activity 2: Analyzing Karyotypes • Biotechnology Applications: Unit 2 Lab 4 Activity 3: The Blue People of Troublesome Creek • Teacher Resource CD: Biotechnology in Forensic Science • Teacher Resource CD: Biotechnology in Medicine • Virtual Laboratory: Preparation and Analysis of a Human Karyotype |
| CONTENT STANDARD | CA.4. | <p>Biology/Life Sciences: Genetics: Genes are a 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 understanding this concept:</p> |
| PERFORMANCE STANDARD | 4.c. | <p>Students know how mutations in the DNA sequence of a gene may or may not affect the expression of the gene or the sequence of amino acids in an encoded protein.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 2 Lab 4 Activity 2: Analyzing Karyotypes • Biotechnology Applications: Unit 4 Lab 8 Activity 1: Case of the Second Examination • Teacher Resource CD: Biotechnology in Medicine |
| PERFORMANCE STANDARD | 4.d. | <p>Students know specialization of cells in multicellular organisms is usually due to different patterns of gene expression rather than to differences of the genes themselves.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 4 Lab 8 Activity 1: Case of the Second Examination |
| CONTENT STANDARD | CA.5. | <p>Biology/Life Sciences: Genetics: The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells. As a basis for understanding this concept:</p> |
| PERFORMANCE STANDARD | 5.a. | <p>Students know the general structures and functions of DNA, RNA, and protein.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 1 Activity 1: Genetically Modified Crops • Biotechnology Applications: Unit 3 Lab 6 Activity 1: Modeling DNA Profiles to Solve a Mystery • Biotechnology Applications: Unit 3 Lab 7 Activity 1: Comparing Electrophoresed DNA Profiles • Biotechnology Applications: Unit 4 Lab 8 Activity 1: Case of the Second Examination |

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| | | <ul style="list-style-type: none"> • Biotechnology Applications: Unit 4 Lab 8 Activity 2: Finding Out Who Is at Risk for SARS • Teacher Resource CD: Biotechnology in Agriculture and the Environment • Teacher Resource CD: Biotechnology in Forensic Science • Teacher Resource CD: Biotechnology in Medicine |
| PERFORMANCE STANDARD | 5.c. | <p>Students know how genetic engineering (biotechnology) is used to produce novel biomedical and agricultural products.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 1 Activity 1: Genetically Modified Crops • Biotechnology Applications: Unit 1 Lab 2 Activity 1: Making Cheese the Biotech Way • Biotechnology Applications: Unit 1 Lab 3 Activity 1: Biodegrading a Simulated Oil Spill • Biotechnology Applications: Unit 1 Lab 3 Activity 3: Examining Oil-Degrading Microbes • Biotechnology Applications: Unit 2 Lab 4 Activity 1: Taking a Case History of Baby Mike • Biotechnology Applications: Unit 2 Lab 4 Activity 2: Analyzing Karyotypes • Biotechnology Applications: Unit 2 Lab 4 Activity 3: The Blue People of Troublesome Creek • Biotechnology Applications: Unit 2 Lab 4 Activity 4: Uncovering a Family Secret • Biotechnology Applications: Unit 2 Lab 4 Activity 5: Creating a Pedigree to Analyze a Family Trait • Biotechnology Applications: Unit 2 Lab 5 Activity 1: Diagnosing a Gene Defect • Biotechnology Applications: Unit 3 Lab 6 Activity 1: Modeling DNA Profiles to Solve a Mystery • Biotechnology Applications: Unit 3 Lab 7 Activity 1: Comparing Electrophoresed DNA Profiles • Biotechnology Applications: Unit 4 Lab 8 Activity 2: Finding Out Who Is at Risk for SARS • Teacher Resource CD: Biotechnology in Agriculture and the Environment • Teacher Resource CD: Biotechnology in Forensic Science • Teacher Resource CD: Biotechnology in Medicine |
| PERFORMANCE STANDARD | 5.d. | <p>Students know how basic DNA technology (restriction digestion by endonucleases, gel electrophoresis, ligation, and transformation) is used to construct recombinant DNA molecules.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 1 Activity 1: Genetically Modified Crops • Biotechnology Applications: Unit 1 Lab 3 Activity 1: Biodegrading a Simulated Oil Spill • Biotechnology Applications: Unit 3 Lab 6 Activity 1: Modeling DNA Profiles to Solve a Mystery • Teacher Resource CD: Biotechnology in Agriculture and the Environment • Teacher Resource CD: Biotechnology in Forensic Science |

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| | | <ul style="list-style-type: none"> Teacher Resource CD: Biotechnology in Medicine |
| PERFORMANCE STANDARD | 5.e. | <p>Students know how exogenous DNA can be inserted into bacterial cells to alter their genetic makeup and support expression of new protein products.</p> <ul style="list-style-type: none"> Teacher Resource CD: Biotechnology in Agriculture and the Environment |
| CONTENT STANDARD | CA.6. | Biology/Life Sciences: Ecology: Stability in an ecosystem is a balance between competing effects. As a basis for understanding this concept: |
| PERFORMANCE STANDARD | 6.a. | <p>Students know biodiversity is the sum total of different kinds of organisms and is affected by alterations of habitats.</p> <ul style="list-style-type: none"> Biotechnology Applications: Unit 3 Lab 6 Activity 1: Modeling DNA Profiles to Solve a Mystery |
| PERFORMANCE STANDARD | 6.b. | <p>Students know how to analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of nonnative species, or changes in population size.</p> <ul style="list-style-type: none"> Biotechnology Applications: Unit 1 Lab 3 Activity 1: Biodegrading a Simulated Oil Spill Biotechnology Applications: Unit 1 Lab 3 Activity 2: Cleaning up Mini-Oil Spills in Various Shore Environments Biotechnology Applications: Unit 1 Lab 3 Activity 3: Examining Oil-Degrading Microbes |
| PERFORMANCE STANDARD | 6.c. | <p>Students know how fluctuations in population size in an ecosystem are determined by the relative rates of birth, immigration, emigration, and death.</p> <ul style="list-style-type: none"> Biotechnology Applications: Unit 1 Lab 3 Activity 1: Biodegrading a Simulated Oil Spill Biotechnology Applications: Unit 1 Lab 3 Activity 2: Cleaning up Mini-Oil Spills in Various Shore Environments Biotechnology Applications: Unit 1 Lab 3 Activity 3: Examining Oil-Degrading Microbes Biotechnology Applications: Unit 2 Lab 4 Activity 3: The Blue People of Troublesome Creek |
| CONTENT STANDARD | CA.7. | Biology/Life Sciences: Evolution: The frequency of an allele in a gene pool of a population depends on many factors and may be stable or unstable over time. As a basis for understanding this concept: |
| PERFORMANCE STANDARD | 7.b. | <p>Students know why alleles that are lethal in a homozygous individual may be carried in a heterozygote and thus maintained in a gene pool.</p> <ul style="list-style-type: none"> Biotechnology Applications: Unit 2 Lab 4 Activity 1: Taking a Case History of Baby Mike Biotechnology Applications: Unit 2 Lab 4 Activity 2: Analyzing Karyotypes Biotechnology Applications: Unit 2 Lab 4 Activity 3: The Blue People of Troublesome Creek Biotechnology Applications: Unit 2 Lab 4 Activity 4: Uncovering a Family Secret Biotechnology Applications: Unit 2 Lab 4 Activity 5: Creating a Pedigree to Analyze a Family Trait |

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| | | <ul style="list-style-type: none"> • Biotechnology Applications: Unit 2 Lab 5 Activity 1: Diagnosing a Gene Defect • Biotechnology Applications: Unit 4 Lab 8 Activity 1: Case of the Second Examination • Teacher Resource CD: Biotechnology in Medicine • Virtual Laboratory: Preparation and Analysis of a Human Karyotype |
| PERFORMANCE STANDARD | 7.c. | <p>Students know new mutations are constantly being generated in a gene pool.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 2 Lab 4 Activity 2: Analyzing Karyotypes • Teacher Resource CD: Biotechnology in Medicine |
| CONTENT STANDARD | CA.8. | <p>Biology/Life Sciences: Evolution: Evolution is the result of genetic changes that occur in constantly changing environments. As a basis for understanding this concept:</p> |
| PERFORMANCE STANDARD | 8.b. | <p>Students know a great diversity of species increases the chance that at least some organisms survive major changes in the environment.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 3 Lab 6 Activity 1: Modeling DNA Profiles to Solve a Mystery |
| CONTENT STANDARD | CA.10. | <p>Biology/Life Sciences: Physiology: Organisms have a variety of mechanisms to combat disease. As a basis for understanding the human immune response:</p> |
| PERFORMANCE STANDARD | 10.c. | <p>Students know how vaccination protects an individual from infectious diseases.</p> <ul style="list-style-type: none"> • Teacher Resource CD: Biotechnology in Agriculture and the Environment |
| PERFORMANCE STANDARD | 10.d. | <p>Students know there are important differences between bacteria and viruses with respect to their requirements for growth and replication, the body's primary defenses against bacterial and viral infections, and effective treatments of these infections.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 2 Activity 1: Making Cheese the Biotech Way • Biotechnology Applications: Unit 1 Lab 3 Activity 1: Biodegrading a Simulated Oil Spill • Biotechnology Applications: Unit 1 Lab 3 Activity 2: Cleaning up Mini-Oil Spills in Various Shore Environments • Biotechnology Applications: Unit 1 Lab 3 Activity 3: Examining Oil-Degrading Microbes • Biotechnology Applications: Unit 4 Lab 8 Activity 1: Case of the Second Examination • Biotechnology Applications: Unit 4 Lab 8 Activity 2: Finding Out Who Is at Risk for SARS |
| PERFORMANCE STANDARD | 10.e. | <p>Students know why an individual with a compromised immune system (for example, a person with AIDS) may be unable to fight off and survive infections by microorganisms that are usually benign.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 4 Lab 8 Activity 1: Case of the Second Examination • Biotechnology Applications: Unit 4 Lab 8 Activity 2: Finding Out Who Is |

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| | | at Risk for SARS |
| CONTENT STANDARD | CA.9. | Earth Sciences: California Geology: The geology of California underlies the state's wealth of natural resources as well as its natural hazards. As a basis for understanding this concept: |
| PERFORMANCE STANDARD | 9.a. | <p>Students know the resources of major economic importance in California and their relation to California's geology.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 3 Activity 1: Biodegrading a Simulated Oil Spill • Biotechnology Applications: Unit 1 Lab 3 Activity 2: Cleaning up Mini-Oil Spills in Various Shore Environments • Biotechnology Applications: Unit 1 Lab 3 Activity 3: Examining Oil-Degrading Microbes |
| CONTENT STANDARD | CA.1. | Investigation and Experimentation: Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop their own questions and perform investigations. Students will: |
| PERFORMANCE STANDARD | 1.a. | <p>Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 1 Activity 1: Genetically Modified Crops • Biotechnology Applications: Unit 1 Lab 2 Activity 1: Making Cheese the Biotech Way • Biotechnology Applications: Unit 1 Lab 3 Activity 1: Biodegrading a Simulated Oil Spill • Biotechnology Applications: Unit 1 Lab 3 Activity 2: Cleaning up Mini-Oil Spills in Various Shore Environments • Biotechnology Applications: Unit 1 Lab 3 Activity 3: Examining Oil-Degrading Microbes • Biotechnology Applications: Unit 2 Lab 4 Activity 1: Taking a Case History of Baby Mike • Biotechnology Applications: Unit 2 Lab 4 Activity 2: Analyzing Karyotypes • Biotechnology Applications: Unit 2 Lab 4 Activity 3: The Blue People of Troublesome Creek • Biotechnology Applications: Unit 2 Lab 4 Activity 4: Uncovering a Family Secret • Biotechnology Applications: Unit 2 Lab 4 Activity 5: Creating a Pedigree to Analyze a Family Trait • Biotechnology Applications: Unit 2 Lab 5 Activity 1: Diagnosing a Gene Defect • Biotechnology Applications: Unit 3 Lab 6 Activity 1: Modeling DNA Profiles to Solve a Mystery • Biotechnology Applications: Unit 3 Lab 7 Activity 1: Comparing Electrophoresed DNA Profiles • Biotechnology Applications: Unit 4 Lab 8 Activity 1: Case of the Second Examination • Biotechnology Applications: Unit 4 Lab 8 Activity 2: Finding Out Who Is at Risk for SARS • Virtual Laboratory: Preparation and Analysis of a Human Karyotype |

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| PERFORMANCE STANDARD | 1.g. | <p>Recognize the usefulness and limitations of models and theories as scientific representations of reality.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 3 Activity 2: Cleaning up Mini-Oil Spills in Various Shore Environments • Biotechnology Applications: Unit 3 Lab 6 Activity 1: Modeling DNA Profiles to Solve a Mystery |
| PERFORMANCE STANDARD | 1.i. | <p>Analyze the locations, sequences, or time intervals that are characteristic of natural phenomena (e.g., relative ages of rocks, locations of planets over time, and succession of species in an ecosystem).</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 2 Lab 4 Activity 2: Analyzing Karyotypes • Biotechnology Applications: Unit 3 Lab 6 Activity 1: Modeling DNA Profiles to Solve a Mystery • Biotechnology Applications: Unit 3 Lab 7 Activity 1: Comparing Electrophoresed DNA Profiles • Biotechnology Applications: Unit 4 Lab 8 Activity 1: Case of the Second Examination • Biotechnology Applications: Unit 4 Lab 8 Activity 2: Finding Out Who Is at Risk for SARS |
| PERFORMANCE STANDARD | 1.j. | <p>Recognize the issues of statistical variability and the need for controlled tests.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 2 Lab 5 Activity 1: Diagnosing a Gene Defect |
| PERFORMANCE STANDARD | 1.k. | <p>Recognize the cumulative nature of scientific evidence.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 2 Lab 4 Activity 1: Taking a Case History of Baby Mike • Biotechnology Applications: Unit 2 Lab 4 Activity 2: Analyzing Karyotypes • Biotechnology Applications: Unit 2 Lab 4 Activity 3: The Blue People of Troublesome Creek • Biotechnology Applications: Unit 2 Lab 4 Activity 4: Uncovering a Family Secret • Biotechnology Applications: Unit 2 Lab 4 Activity 5: Creating a Pedigree to Analyze a Family Trait |
| PERFORMANCE STANDARD | 1.l. | <p>Analyze situations and solve problems that require combining and applying concepts from more than one area of science.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 1 Activity 1: Genetically Modified Crops • Biotechnology Applications: Unit 1 Lab 2 Activity 1: Making Cheese the Biotech Way • Biotechnology Applications: Unit 1 Lab 3 Activity 1: Biodegrading a Simulated Oil Spill • Biotechnology Applications: Unit 1 Lab 3 Activity 2: Cleaning up Mini-Oil Spills in Various Shore Environments • Biotechnology Applications: Unit 1 Lab 3 Activity 3: Examining Oil-Degrading Microbes • Biotechnology Applications: Unit 2 Lab 4 Activity 1: Taking a Case |

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| | | <p>History of Baby Mike</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 2 Lab 4 Activity 2: Analyzing Karyotypes • Biotechnology Applications: Unit 2 Lab 4 Activity 3: The Blue People of Troublesome Creek • Biotechnology Applications: Unit 2 Lab 4 Activity 4: Uncovering a Family Secret • Biotechnology Applications: Unit 2 Lab 4 Activity 5: Creating a Pedigree to Analyze a Family Trait • Biotechnology Applications: Unit 2 Lab 5 Activity 1: Diagnosing a Gene Defect • Biotechnology Applications: Unit 3 Lab 6 Activity 1: Modeling DNA Profiles to Solve a Mystery • Biotechnology Applications: Unit 3 Lab 7 Activity 1: Comparing Electrophoresed DNA Profiles • Biotechnology Applications: Unit 4 Lab 8 Activity 1: Case of the Second Examination • Biotechnology Applications: Unit 4 Lab 8 Activity 2: Finding Out Who Is at Risk for SARS • Virtual Laboratory: Preparation and Analysis of a Human Karyotype |
| <p>PERFORMANCE STANDARD</p> | <p>1.m.</p> | <p>Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. Examples of issues include irradiation of food, cloning of animals by somatic cell nuclear transfer, choice of energy sources, and land and water use decisions in California.</p> <ul style="list-style-type: none"> • Biotechnology Applications: Unit 1 Lab 1 Activity 1: Genetically Modified Crops • Biotechnology Applications: Unit 1 Lab 2 Activity 1: Making Cheese the Biotech Way • Biotechnology Applications: Unit 1 Lab 3 Activity 1: Biodegrading a Simulated Oil Spill • Biotechnology Applications: Unit 1 Lab 3 Activity 2: Cleaning up Mini-Oil Spills in Various Shore Environments • Biotechnology Applications: Unit 1 Lab 3 Activity 3: Examining Oil-Degrading Microbes • Biotechnology Applications: Unit 2 Lab 4 Activity 1: Taking a Case History of Baby Mike • Biotechnology Applications: Unit 2 Lab 4 Activity 2: Analyzing Karyotypes • Biotechnology Applications: Unit 2 Lab 4 Activity 3: The Blue People of Troublesome Creek • Biotechnology Applications: Unit 2 Lab 4 Activity 4: Uncovering a Family Secret • Biotechnology Applications: Unit 2 Lab 4 Activity 5: Creating a Pedigree to Analyze a Family Trait • Biotechnology Applications: Unit 2 Lab 5 Activity 1: Diagnosing a Gene Defect • Biotechnology Applications: Unit 3 Lab 6 Activity 1: Modeling DNA Profiles to Solve a Mystery • Biotechnology Applications: Unit 3 Lab 7 Activity 1: Comparing Electrophoresed DNA Profiles • Biotechnology Applications: Unit 4 Lab 8 Activity 1: Case of the Second Examination • Biotechnology Applications: Unit 4 Lab 8 Activity 2: Finding Out Who Is at Risk for SARS |

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| | | <ul style="list-style-type: none">• Teacher Resource CD: Biotechnology in Agriculture and the Environment• Teacher Resource CD: Biotechnology in Forensic Science• Teacher Resource CD: Biotechnology in Medicine• Virtual Laboratory: Preparation and Analysis of a Human Karyotype |
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