

# Unit Overview

## Unit Length

20-22 class periods,  
approximately 4-5 weeks.

## Objectives

The students will:

- Compare observable genetic traits to the traits of classmates and family members, and interpret the differences in the two sets of data.
- Use Punnett squares as tools to predict potential offspring genotypes and phenotypes of parental crosses.
- Examine the relationships between mutations and/or environmental changes and the viability of a species.
- Construct a three-gene DNA model and genetically modify a hypothetical trait change.
- Design and defend a hypothetical genetically improved agricultural product to secure findings to market the new product.
- Conceptualize the complexity of the genetic make up of living organisms and appreciate the benefits and challenges associated with the modifications of an organism's genome.

## Brief Description

This self-contained science unit allows students to move from the past, through the present, and toward the future with biotechnology. The students start with the basics of heredity by examining personal and family traits; they then use Punnett squares to predict possible phenotypic outcomes for a variety of plant breedings. The terms of dominance, co-dominance, and recessiveness are discussed. In the third lesson, students act as birds to demonstrate “survival of the fittest” in a changing environment. This activity illustrates that changes in a species may occur over time in “natural” circumstances. The fourth lesson has the students build a model of a portion of a DNA molecule and then genetically alter it to produce a trait change. Finally, working in teams, the students act as genetic engineers. They design and market a genetically improved product. In doing so, they address the viability and ethics of genetic engineering. Agricultural examples are used throughout the unit.

## Curriculum Content Standards for California Public Schools

A concerted effort to improve student achievement in all academic areas has impacted education throughout California. The California Foundation for Agriculture in the Classroom provides educators with numerous resource materials and lessons that can be used to teach and reinforce the Curriculum Content Standards for California Public Schools. The goal of educators is to encourage students to think for themselves, ask questions, and learn problem-solving skills while learning the specific content needed to better understand the world in which they live.

This unit, *From Genes to Jeans*, includes lessons that teach or reinforce many of the educational content standards covered in grades seven through nine. It can be used as a self-contained unit, to enhance the lessons already in use, or provide technical information in the areas of genetics and agriculture.

The specific subject matter content standards covered in the lessons are listed on the sidebars of each lesson. A matrix chart showing how the entire unit is aligned with the Curriculum Content Standards for California Public Schools can be found on pages 78-90. This unit works well to teach genetics and evolution concepts in the seventh grade; investigation and experimentation concepts in grades seven and nine; and mathematical reasoning, technical reading, and oral reading and writing skills in grades seven through nine.

# Unit Overview

## Key Vocabulary

Appropriate vocabulary is discussed in each lesson. A glossary is located on pages 91-95.

amino acid  
antibiotic  
antigen  
bacterium  
base  
base pair  
biotechnology  
chromosome  
clone  
co-dominance  
codon  
crossing over  
Darwin, Charles  
DNA  
dominant  
enzyme  
evolution  
expression  
gene  
gene expression  
genetic code  
genetic engineering  
genetics  
genome  
genotype  
heredity  
heterozygous  
homozygous  
hybridization  
ligase  
meiosis  
Mendel, Gregor  
mutant  
mutation  
natural selection  
nucleic acids  
nucleotides  
nucleus  
phenotype

## Sequence of Events

- Review the enclosed background information, lessons, and student worksheets. Make appropriate changes to the unit to meet the needs of your students, facilities, time frame, and teaching style.
- Gather appropriate supplies and resource materials.
- Complete the activities in the following order:
  1. Just Like Me
  2. Let's Get Square
  3. Bird Land
  4. Design Yer Genes
  5. Snappy Products, Inc.

## Evaluation

This unit incorporates numerous activities and questions that can be used as evaluation tools, many of which can be included in student portfolios. The concluding activity, *Snappy Products, Inc.*, requires the students to apply what they have learned to a hypothetical, yet realistic, situation. Other evaluation factors may include active participation in class discussions and general knowledge acquired about the subject matter.

## Visual Display Ideas

- Create a collage or free-standing display of products changed through biotechnology. Examples may include tomatoes, cotton, canola oil, papayas, soybeans, corn, and rice.
- Make a display of chromosomes, DNA molecules, genes, and proteins.
- Show the process of protein synthesis using a sequential flow chart.
- Create a display illustrating the sequence of events that occurs to produce a genetically modified plant product.
- Use pictures, graphs or charts to show the specific number of chromosomes in particular plants and animals.



# Unit Overview

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## **Key Vocabulary**

*(continued)*

plasmid  
polymerase  
protein  
recessive  
recombination  
RNA  
selective breeding  
tissue culture  
trait  
transcription  
transformation  
transgenic organism  
translation  
vector  
virus