

By the end of this unit, students will be able to...

1. Summarize the major limitations of traditional breeding and artificial selection.
2. Define each of the following: a. Genetic Engineering b. Genetically Modified Organism (GMO) c. Genome d. Restriction Enzyme
3. Describe and identify a sticky end and a blunt end, and describe the importance of sticky ends to genetic engineering.
4. Summarize the role of DNA ligase in genetic engineering.
5. Identify the restriction site of a given restriction enzyme.
6. Describe Bt corn and explain how and why it was created.
7. Describe the relationship between DNA of different species and how it is possible to insert a gene from one species into a different species.
8. Summarize how plasmids, viruses, yeast artificial chromosomes, and heavy metal particles are used as vectors in genetic engineering.
9. Summarize the methods and benefits that are specific to each kind of vector used in genetic engineering.
10. Describe how and why markers are used in genetic engineering, particularly the following types: 1) genes for antibiotic resistance; 2) genes for herbicide resistance; 3) visual markers such as GFP and luciferase.
11. Explain why genetic modification was needed for insulin production and clarify why the genes that are a part of the *lac operon* were inserted with the gene for human insulin to modified bacterial cells.
12. Summarize the roles of the operator and promoter in the function and expression of genes.
13. ESSAY: Explain how genetic modification using *Agrobacterium* was used to produce Golden Rice.
14. ESSAY: Summarize how CRISPR-Cas9 is used for genetic engineering, focusing on gRNA and Cas9 restriction enzymes, and how this was used to create an experimental treatment for HIV-AIDS.