

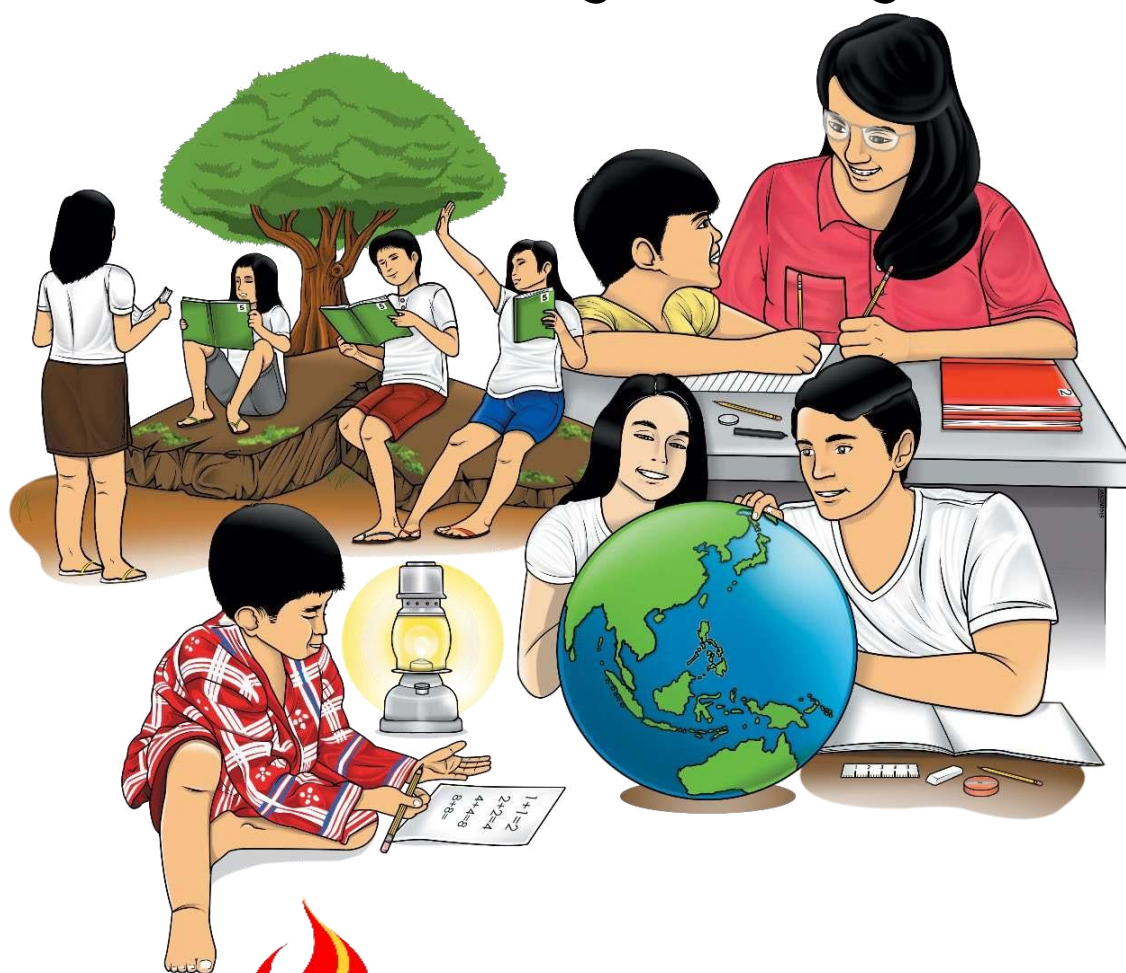
Senior High School



Earth and Life Science

Quarter 2 – Module 4:

Genetic Engineering



ALTERNATIVE DELIVERY MODE

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Earth and Life Science Alternative Delivery Mode

Quarter 2 – Module 4: Genetic Engineering

First Edition, 2021

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What I Need to Know

This module was designed and written with you in mind. It is here to help you master the nature of Earth and Life Science. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are arranged to follow the standard sequence of the course. But the order in which you read them can be changed to correspond with the textbook you are now using.

The module has one lesson:

- Lesson 1 – Genetic Engineering

After going through this module, you are expected to:

1. define genetic engineering;
2. describe the techniques in genetic engineering as based from the situation given; and
3. appreciate the role of genetic engineering to human life

Lesson

1

Genetic Engineering

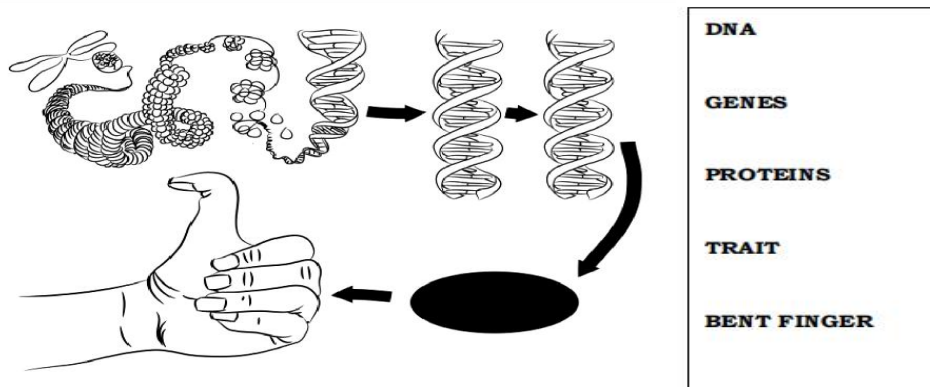
Genetic engineering is the direct manipulation of an organism's genes using biotechnology. It covers different kinds of technologies used to alter the genomes that includes the insertion of genes from other individual either the same or from different species that aims to produce or improve products.



What's In

Activity 1: DNA, Genes, Proteins and Individual Trait

Use the diagram and the grid below to answer the questions.



1. What are the roles of the DNA, genes and proteins in a given trait?
2. How would you relate the individual trait or characteristics to proteins, genes and DNA?
3. Would the manifestation of a trait be affected once the DNA nor the genes are altered? Why? Explain your answer.



What's New

Activity 2: Students are asked to answer the questions.

1. What do you think are the objectives of scientists in genetic engineering?
2. How are scientists able to realize their objectives in genetic engineering?
3. Can you cite the techniques in genetic engineering scientists utilize in creating outcomes?



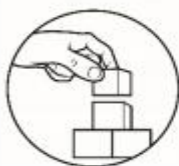
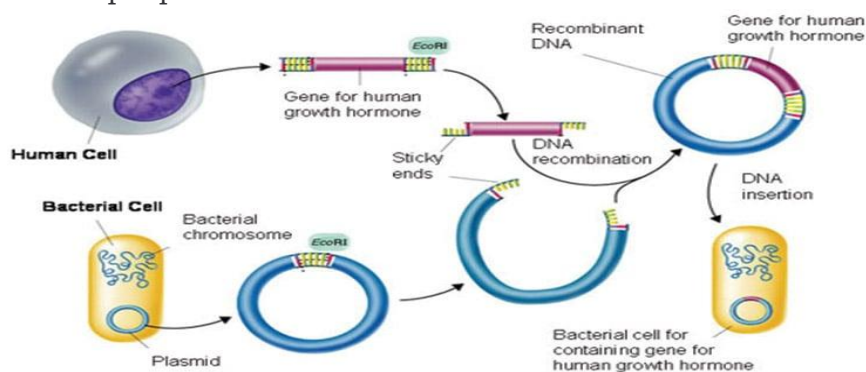
What Is It

Since ancient times the practice of genetic engineering had begun. **Artificial selection** is done to indirectly manipulate genes focusing on the

physical traits among organisms. Breeders choose which organism to mate and produce offspring with desirable traits. They maintain this procedure without control of what genes can be passed. **Selective breeding** is a process when animals with desired characteristics are mated to produce offspring with those desired traits such as Angus cows are bred to increase more meat. **Hybridizations** are when two individuals with unlike characteristics are crossed to produce the best in both organisms like the disease resistant potato called the Burbank potato. **Inbreeding** is a technique of breeding organisms that are genetically similar to maintain desired traits found in the pure dog breeds. As defined, **genetic engineering** is the process of changing the DNA in living organisms to create something new. It involves artificial manipulation, modification, and recombination of DNA or other nucleic acid molecules to modify an organism or population of organisms.

Recombination DNA Technology

Recombination DNA is made by mixing DNA from two different sources. Restriction enzymes were discovered in 1968 by Swiss microbiologist **Werner Arbe**. This was used to splice, connect (or ligate), and remove or add nucleotides to sequences of the DNA. This process is used in recombinant DNA technology to remove and insert genetic sequences from and into other sequences of other organisms. Inserting the desired gene into the genome of the host involves the selection of the desired gene for administration into the host followed by a selection of the perfect vector (either plasmid or bacteriophage) with which the gene has to be integrated and a recombinant DNA is formed. The recombinant DNA has to be introduced into the host, maintained and carried forward to the offspring. Biotechnology and pharmaceutical companies practice these techniques in working with medical and research purpose.



What's More

Activity 3: Match me!

Using the terms in the box, match the genetic techniques with their descriptions. Write your answer in separate sheet of paper.

GEL ELECTROPHORESIS;	GENE SPLICING
CLONING;	INBREEDING
HYBRIDIZATION;	SELECTIVE BREEDING

- _____ 1. A science of changing the DNA in a living organism to create something new
- _____ 2. Breeders choose which organism to mate to produce offspring with desired traits.
- _____ 3. Animals with desired characteristics are mated to produce offspring with those desired traits.
- _____ 4. Two individuals with unlike characteristics are crossed to produce the best in both organisms.
- _____ 5. Breeding of organisms that are genetically similar to maintain desired traits.
- _____ 6. Creating an organism that is an exact genetic copy of another
- _____ 7. DNA is cut out of one organism and put into another organism
- _____ 8. A technique used to compare DNA from two or more organisms.



What I Have Learned

1. Genetic engineering is the process of changing the DNA in living organisms to create something new.
2. Artificial selection is practiced to indirectly manipulate genes focusing on the physical traits among organisms. This include selective breeding, hybridization and inbreeding.
3. Genetic engineering is referred to various techniques used for the modification or manipulation of organisms through the processes of heredity and reproduction.
4. This includes cloning, gene splicing, gel electrophoresis and DNA recombinant technology.
5. Recombination DNA technology use to remove and insert genetic sequences from and into other sequences of another organism.
6. The tools used in Recombination DNA technology are restriction enzymes, vectors and host organisms.



What I Can Do

Activity 4: Genetic Engineering Techniques

Directions. Distinguish the techniques in genetic engineering as based from the situations and examples given. Write the letter of the correct answer on a separate sheet of paper.

- | | |
|---------------------------------------|-----------------------|
| A. Artificial selection | B. Selective breeding |
| C. Hybridization | D. Inbreeding |
| E. Cloning | F. Gene splicing |
| G. Gel electrophoresis: analyzing DNA | |

- ___ 1. This is when animals with desired characteristics are mated to produce offspring with those desired traits. Dachshunds were once bred to hunt badgers and other burrowing animals.
- ___ 2. Creating an organism that is an exact genetic copy of another. They will have the same exact DNA as the parent.
- ___ 3. DNA is cut out of one organism and put into another organism. A trait will be transferred from one organism to another.
- ___ 4. Luther Burbank created a disease resistant potato called the Burbank potato. He crossed a disease resistant plant with one that had a large food producing capacity.
- ___ 5. A technique used to compare DNA from two or more organisms.
- ___ 6. Breeding of organisms that are genetically similar to maintain desired traits. It keeps each breed unique from others.

Activity 5: Genetic Engineering Techniques

Directions. Voice out your perceptions on the following statements about the current technology in genetic engineering. Discuss whether you agree or not. Your answer must have an in-depth analysis of the statement with clear expression and no grammatical errors. Write your answers in your journal notebook. Choose two from the three techniques.

- 1. Monkeys have been Cloned, Paving the Way for Human Cloning
- 2. Bacteria as Living Microrobots to Fight Cancer
- 3. Two genetic regions (*variants in both ABO blood group locus and cluster of genes in chromosome 3*) Linked with Severe COVID-19

RUBRICS	Above Expectation	Meets Expectation	Below expectation
ANALYSIS	Response provided an in-depth analysis of the question given. Show an understanding of the lesson. Examples were given to explain the concept.	Response provided an in-depth analysis of the question given. Show little understanding of the lesson. Examples were given to explain the concept.	Response do not provide an in-depth analysis of the question given. Show an understanding of the lesson. Examples were not given to explain the concept.
CLARITY	The thoughts were clearly expressed and the organization of the words were exemplified.	The thoughts were slightly expressed and the organization of the words were exemplified.	The thoughts were unexpressed and there is no organization of the words in the sentence.
WRITING SKILL	Clear writing complete sentence, no errors in grammar and spelling.	Clear writing with errors in grammar and spelling.	Unclear writing complete sentence, all errors in grammar and spelling.



Additional Activities

Activity 6: PROS and CONS

A. Directions. Conduct a short interview with one or two of your family members. Ask them about how they think of the positive and negative effects of genetic engineering. List all their responses. Below is the rubric that will

guide you on what to do in the activity. Write your answer on a separate sheet of paper.

QUESTIONS	RESPONSES

B. Make a list of pros and cons of genetic engineering by summarizing the interview done. Below is the rubric that will guide you on what to do in the activity. Write your answer on a separate sheet of paper.

PROS	CONS

Rubrics

0	The student has not reached a standard described by any descriptors given below.
1	The student demonstrates minimal communication and collaboration in providing information, literacy, thinking and reflection.
2	The student demonstrates communication and collaboration in providing information, literacy, thinking and reflection.
3	The student demonstrates satisfactory communication and collaboration in providing information, literacy, thinking and reflection.
4	The student demonstrates well developed communication and collaboration in providing information, literacy, thinking and reflection.

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