Key: Yellow highlight = required component

Genetic Engineering and Protein Synthesis

Subject Area(s)

Biology

Life Science

Curricular Unit Title

What does DNA do?

Header

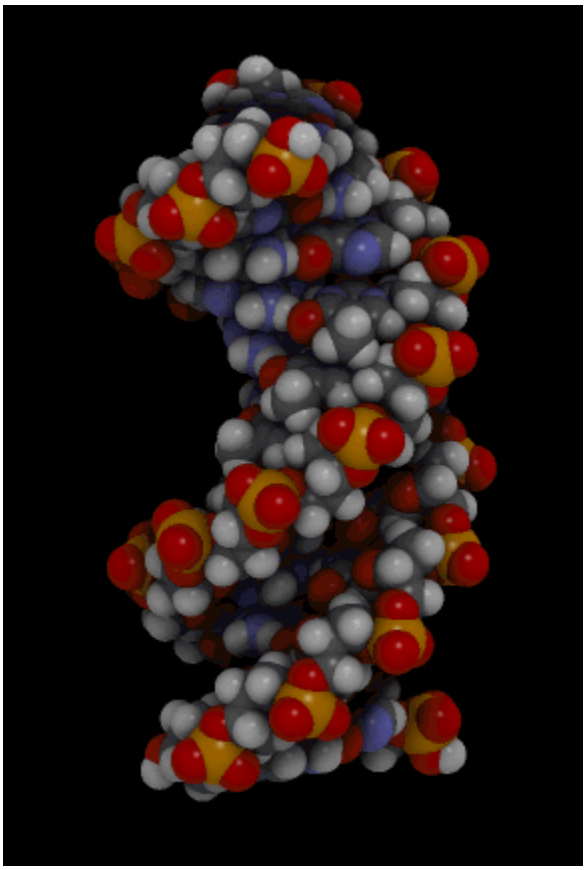

Image 1

Image file: DNA.gif

ADA Description: A computer generated model of DNA

Source/Rights: Copyright © Spiffistan, Wikimedia Commons (http://commons.wikimedia.org/wiki/File:Bdna_cropped.gif)

Caption: Double Stranded DNA structure

Grade Level

9 (9-12)

Summary

This unit begins with an introduction to genetic engineering to grab the students attention before moving on to some basic biology topics. The entire gene expression process is covered, focusing on DNA transcription/translation and how this relates to protein synthesis. Mutations are also covered at the end of this unit to emphasize that changes to DNA are not always intentional. Multiple activities are included to help the students better understand the lessons.

Engineering Connection

Genetic engineering is a field with a growing number of practical applications. Engineers have developed genetic recombination techniques to manipulate gene sequences to have organisms express specific traits. It is integral that genetic engineers understand how traits are expressed and what effects will be produced by altering the DNA of an organism. Gene expression is a result of the protein synthesis process which reads DNA as a set of instructions for building specific proteins. Once this process is well understood, and genes are classified based on the desired trait, engineers develop ways to alter the genes to create a net benefit to us or the organism. This could include anything such as larger cows that produce more meat, pest resistant crops, or bacteria that produce fuel.

Engineering Category = 1

Choose the category that best describes this unit's amount/depth of engineering content:

1. Relating science and/or math concept(s) to engineering
2. Engineering analysis or partial design
3. Engineering design process

Keywords

DNA, gene, genetic engineering, genetically modified organism (GMO), genome, mutation, protein, recombination, transcription, translation

Educational Standards

Related Lessons & Activities

Related Lessons:

1. Genetic Engineering – Introduction to Genetic Engineering and Its Applications
2. Protein Synthesis – Building Proteins
3. Mutations – Unexpected Changes

Related Activities:

- Bacteria Transformation – Building a Better Bacteria
- Modeling Protein Synthesis – How to Build a Protein
- Mutation Modeling – Mutation Telephone

Time Required

1 week, 4 hours spread over five 45 minute classes

Unit Overview

1. Basic overview of genetic engineering
2. Covers protein synthesis, specifically DNA transcription and translation
3. Covers the different types of mutations and how they can affect protein synthesis

Unit Schedule

Recommended order of lessons and activities:

Lesson 1: Genetic Engineering

Activity: Building a Better Bacteria

Lesson 2: Protein Synthesis

Activity: How to Build a Protein

Lesson 3: Mutations

Activity: How do mutations happen?

Summary Assessment

Attachments

Other

Redirect URL

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Supporting Program

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Classroom Testing Information

This unit was performed fall of 2013 at Galena Park HS in Galena Park, TX for 9th grade pre-AP biology classes and fall of 2014 at Clear Creek HS in League City, TX for 9th grade regular biology classes. Overall, this unit went very well. The students found the relations to genetic engineering to be interesting. This worked well because most of the applications are very relatable to the students. Notes on the individual lessons are given there.