

Student Manual

pGLO Transformation

Lesson 1 Introduction to Transformation

In this lab you will perform a procedure known as genetic transformation. Remember that a gene is a piece of DNA, which provides the instructions for making (codes for) a protein. This protein gives an organism a particular trait. Genetic transformation literally means "change caused by genes," and involves the insertion of a gene into an organism in order to change the organism's trait. Genetic transformation is used in many areas of biotechnology. In agriculture, genes coding for traits such as frost, pest, or spoilage resistance can be genetically transformed into plants. In bioremediation, bacteria can be genetically transformed with genes enabling them to digest oil spills. In medicine, diseases caused by defective genes are beginning to be treated by gene therapy; that is, by genetically transforming a sick person's cells with healthy copies of the defective gene that causes the disease.

You will use a procedure to transform bacteria with a gene that codes for Green Fluorescent Protein (GFP). The real-life source of this gene is the bioluminescent jellyfish *Aequorea victoria*. Green Fluorescent Protein causes the jellyfish to fluoresce and glow in the dark. Following the transformation procedure, the bacteria express their newly acquired jellyfish gene and produce the fluorescent protein, which causes them to glow a brilliant green color under ultraviolet light.

In this activity, you will learn about the process of moving genes from one organism to another with the aid of a plasmid. In addition to one large chromosome, bacteria naturally contain one or more small circular pieces of DNA called plasmids. Plasmid DNA usually contains genes for one or more traits that may be beneficial to bacterial survival. In nature, bacteria can transfer plasmids back and forth allowing them to share these beneficial genes. This natural mechanism allows bacteria to adapt to new environments. The recent occurrence of bacterial resistance to antibiotics is due to the transmission of plasmids.

Bio-Rad's unique pGLO plasmid encodes the gene for GFP and a gene for resistance to the antibiotic ampicillin. pGLO also incorporates a special gene regulation system, which can be used to control expression of the fluorescent protein in transformed cells. The gene for GFP can be switched on in transformed cells by adding the sugar arabinose to the cells' nutrient medium. Selection for cells that have been transformed with pGLO DNA is accomplished by growth on ampicillin plates. Transformed cells will appear white (wild-type phenotype) on plates not containing arabinose, and fluorescent green under UV light when arabinose is included in the nutrient agar medium.

You will be provided with the tools and a protocol for performing genetic transformation. Your task will be to:

1. Do the genetic transformation.
2. Determine the degree of success in your efforts to genetically alter an organism.

Pglo Lab Answers Student Manual Lesson 2

**Warren Dolphin,David Vleck,Linda
Westgate,James Colbert**



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Table of Contents Pglo Lab Answers Student Manual Lesson 2

1. Understanding the eBook Pglo Lab Answers Student Manual Lesson 2
 - The Rise of Digital Reading Pglo Lab Answers Student Manual Lesson 2
 - Advantages of eBooks Over Traditional Books
2. Identifying Pglo Lab Answers Student Manual Lesson 2
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Pglo Lab Answers Student Manual Lesson 2
 - User-Friendly Interface
4. Exploring eBook Recommendations from Pglo Lab Answers Student Manual Lesson 2
 - Personalized Recommendations
 - Pglo Lab Answers Student Manual Lesson 2 User Reviews and Ratings
 - Pglo Lab Answers Student Manual Lesson 2 and Bestseller Lists

5. Accessing Pglo Lab Answers Student Manual Lesson 2 Free and Paid eBooks
 - Pglo Lab Answers Student Manual Lesson 2 Public Domain eBooks
 - Pglo Lab Answers Student Manual Lesson 2 eBook Subscription Services
 - Pglo Lab Answers Student Manual Lesson 2 Budget-Friendly Options
6. Navigating Pglo Lab Answers Student Manual Lesson 2 eBook Formats
 - ePub, PDF, MOBI, and More
 - Pglo Lab Answers Student Manual Lesson 2 Compatibility with Devices
 - Pglo Lab Answers Student Manual Lesson 2 Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Pglo Lab Answers Student Manual Lesson 2
 - Highlighting and Note-Taking Pglo Lab Answers Student Manual Lesson 2
 - Interactive Elements Pglo Lab Answers Student Manual Lesson 2
8. Staying Engaged with Pglo Lab Answers Student Manual Lesson 2
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Pglo Lab Answers Student Manual Lesson 2
9. Balancing eBooks and Physical Books Pglo Lab Answers Student Manual Lesson 2
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Pglo Lab Answers Student Manual Lesson 2
10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
11. Cultivating a Reading Routine Pglo Lab Answers Student Manual Lesson 2
 - Setting Reading Goals Pglo Lab Answers Student Manual Lesson 2
 - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Pglo Lab Answers Student Manual Lesson 2
 - Fact-Checking eBook Content of Pglo Lab Answers Student Manual Lesson 2
 - Distinguishing Credible Sources
13. Promoting Lifelong Learning

- Utilizing eBooks for Skill Development
- Exploring Educational eBooks

14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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